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# The Chemical Age

**A Weekly Journal Devoted to Industrial & Engineering Chemistry**

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*NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.*

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### Chemists' Salaries

THE correspondence we publish in this issue on the subject of chemists' salaries shows that opinion is beginning to ferment pretty actively. If the opinion that chemists generally are paid inadequately in proportion to the cost and duration of their education and to the commercial value of their work came only from one side, it might be put down in part to the inevitable discontent of the less successful. But it comes from the other side—from eminent academical and technological authorities like Professor Henry Louis and from eminent commercial leaders like his successor in the presidency of the Society of Chemical Industry—Mr. John Gray. When the evidence from such different points all coincides there must be some substance in the complaint, and unless the supply of competent chemists is to fall off—to the detriment of British industry—some remedy must be found. The moment inquiry is made as to the kind of remedy needed, we shall be told that there is only one way—chemists must organise themselves as other classes do.

Something has already been done in this direction. The Institute of Chemistry, though an academical body, is far from indifferent to the economic status of the chemist. In various ways it is influencing the chemist to demand and the employer to concede a higher standard of remuneration. Then there are two other bodies specially concerned in the salaries question—the British Association of Chemists and the National Association of Industrial Chemists—each of which is now registered as a trade union. At one time there was a decided reluctance on the part of "professional" workers to classify themselves as trade unionists, but the prejudice is passing. Labour must be a one-sided movement while it represents solely manual toil and excludes the even more essential brain-worker, and the increasing consciousness of this on the part of labour organisations is making it easier for the educated classes of workers to find a common basis of action, however much they may object to being merged in the Labour Party politically. The first step, however, is the internal organisation of each class affected—which means, in the case under consideration, that chemists must themselves first of all agree upon a united course of action. We have nothing to say about the respective merits of the organisations already existing. The important point is the need of agreeing upon a policy and combining their forces if they are to make their influence effective. Whether this may best be done by amalgamation or by some federal understanding is a matter for discussion, and we see no reason why the various bodies all claiming to be intensely interested in the matter of chemists' salaries should not confer together and consider the possibility of an alliance, or at least of action along common lines, so as to avoid duplication and overlapping of effort.

### Higher Railway Rates

THE announcement made this week by the Ministry of Transport of a general and very considerable advance in the rates for all classes of goods traffic by rail will be poor comfort for the business man whose trade is being held up by inadequate transport facilities. If the increased charges—varying from 25 per cent. and a flat rate addition of 3d. per ton in the case of coal, coke and patent fuel, to 100 per cent. on small parcels and returned empties—promised to result in a more expeditious and adequate service, the trader would probably pay the tax willingly in order to be able to get on with his business. In the Ministry of Transport's announcement, however, we see no ground for expecting any benefit in return. The new scale of rates does not touch the real difficulty—which is shortage of wagons

—and that difficulty appears to be due to uncertainty as to the Government's railway policy. The railway companies, it is stated, are deterred from building railway wagons by the threat of railway nationalisation, and private firms are not producing them for fear that they may be requisitioned by the Government as soon as they are built. While no attempt is made to repair this vital defect, it seems a little futile to put forward a very serious increase of rates as some sort of relief to the public. It can, in plain words, only benefit the public in one way, and that indirectly. By making it more difficult for traders to use the railways on account of the increased cost, it may force them to devise other means of transport for their own relief. The only other means available would appear to be a much larger use of motor transport and of coastwise sea traffic. In any case the Government are confessedly helpless to do anything for the trading community, and State management of railways is not likely to be advanced by the nation's experience during the past few years.

Unsatisfactory as the position is, an advance of rates would seem, after all, to be the only method open to the Government of escaping from their present difficulty. There is a deficiency for the current year on the working of the railways of £50,000,000, and the first step towards equalising revenue and expenditure is to wipe that deficiency off. The increase on the current rates is estimated to do this, but we are warned that it may do nothing more. In that case a further advance may yet be required to make the railways pay their way—not at all a pleasant prospect for the trading community. As regards the details of the increase, the 25 per cent. on coal, coke, and patent fuel is serious; the most moderate estimate is that it will increase the price by 2s. a ton. It is suggested that the increased rates on the carriage of foodstuffs will be too small, when divided up, to be passed on to the consumer, but the retail dealer is usually so resourceful in passing any additional burdens on to his customers that this view, we fear, does him too much credit. The only merciful provisions we can find in the new scale are the reduction of the existing surcharges for sea traffic on certain merchandise and live stock, and the absence of any advance on the existing rates for the carriage of manure in bulk, packed manure, basic slag and lime for agricultural purposes.

## Manchester College of Technology

THE Manchester Municipal College of Technology is making an appeal to the industrial and commercial community of Manchester and of South-East Lancashire for the sum of £150,000 with a view to the extension of the present building and equipment on land adjoining the college bought some years ago for that purpose at a cost of £44,000. As the reports recently published in THE CHEMICAL AGE show, the College has an active Department of Applied Chemistry and the lectures now in course of delivery illustrate the well-directed efforts which are being made to link up science with industry. For this purpose there is no finer field than the great industrial community of which Manchester is the centre. At the Owens College, now the University of Manchester, an exceptionally strong School of Chemistry was built up under the leadership of Sir Henry Roscoe, and what is now wanted is a fuller use of the endless opportunities the chemical, engineering, and textile industries of the district afford for the application of chemical and other sciences to industry. The College of Technology is one great instrument for the attainment of this end. Its present teaching resources are already over taxed by full-time day students, who now exceed five hundred, the majority of whom are preparing to proceed to degrees in the faculty of technology in the University, while others are engaged in whole-time post-graduate scientific industrial research. There is no doubt at all that as the value of technical education becomes more widely recognised the number of students will continue to be augmented, and the governing body is determined to make the fullest possible preparation for the increase, having regard to the competition to be certainly expected from foreign nations in the overseas markets. Experience generally shows that in these matters it is wise to plan for the future on a large and courageous scale. The development of the Owens College itself is an example of the lack of this foresight. For years past it has had to keep adding a bit here and a bit there to the existing buildings, with the result that instead of developing along well thought out lines, the present group of crowded buildings is a perfect medley of styles. The £150,000 which the College of Technology is appealing for may seem a large sum, but certainly not in excess of the great wealth of the district. Some £26,000 has been secured already, and it would be unlike Manchester if it failed to respond to this appeal to make its educational provision equal to its industrial prestige.

## Applications of Liquid Fuel

ONE of the most noteworthy features of the present year has been the rapid development which has taken place in the utilisation of oil as a fuel in lieu of coal. During the past three months the reputation of oil as a means of steam raising has been firmly established. Although the chief advance has occurred in marine directions, many foreign railway undertakings are taking steps to give oil-firing systems a thorough trial, and it is unlikely that the leading railway engineers in this country will be content to remain indifferent to these developments. For the moment, of course, the question essentially affects those railways whose systems take them more or less into the oil-bearing districts; and, consequently, the home railways are at a big disadvantage. Oil fuel, however, apart from the merits it possesses in the way of handling, control, and labour, provides an alluring alternative from the point of view of cost. If, for instance, we consider coal with a potential heat energy of some 30 million B.Th.U. per ton, at £3 10s. per ton, then from the point of view of the initial cost of energy it does not stand very far in front of oil at £7 per ton, which contains 40 million B.Th.U.

As to the conversion of steamships, one of the principal oil-importing companies is now operating the whole of its fleet of "tankers" with the newer fuel. Announcements have recently been made that, in common with many others, the P. and O., the White Star and the Cunard lines have decided to equip certain of their vessels with the necessary apparatus. Another

well-known firm has already gone a stage further, and announces that it has under construction two vessels fitted with Diesel engines. The wholesale conversion of steamships is not, of course, to be expected forthwith, for oil is not so readily procurable as coal, although steps are now being taken to provide convenient centres for replenishing. In this country bulk oil-storage facilities are notoriously deficient at the moment; but the authorities at such ports as Hull are already moving. In fact, the Hull Chamber of Commerce is now considering a proposal for the laying down of a pipeline, and suggestions have been made that the great industrial centres of Yorkshire might be connected up with a fuel line starting from one of the East Coast ports. As regards the imports of petroleum during the present year, up to the end of November we had spent £33,000,000 under this heading, the figure representing more than 650 million gallons. Many will not be surprised, however, to find that even this immense quantity is well below our imports for the previous year, the reason being that during 1918 we had a remarkably heavy consumption for naval and other war purposes.

Perhaps one of the most interesting developments in connection with oil is the utilisation of colloidal fuels which have met with considerable success in America. A solution seems to have been found to the problem of producing mixtures of oil and pulverised coal in which the coal remains in suspension for an indefinite period. Possibly, therefore, the principle of colloidal fuel may yet play an important part in enabling us to utilise the poor quality slack coal, of which it is at present difficult to dispose.

## Sulphuric Acid Prices

FROM information which reaches us it seems highly probable that the price of sulphuric acid will be raised as from the beginning of the New Year. The National Sulphuric Acid Association has been trying to arrive at a decision by means of a referendum, and—judging from the result—all the recommendations made with regard to future prices by the Costing Committee have been approved by members of the Association. As regards non-arsenical or de-arsenicated acid, the sale price is to be advanced by 10s. per ton at 140 deg. Tw. This will make the new price 115s. per ton at standard gravity, with a variation of 8d. per degree Tw., high or low. Other grades of acid are raised in price in proportion. The Costing Committee also recommended that contracts should not be entered into which called for delivery for a longer period than three months from the 1st inst., and before the expiration of this period it is proposed to reconsider prices.

As regards B.O.V. free from arsenic it is to be noted that so far as acid sold to gasworks for the manufacture of sulphate of ammonia is concerned, the increase in price is to be only half of the advance suggested in the case of other consumers. This is, perhaps, a little difficult to understand; but possibly it may be due to the fact that the gasworks themselves are becoming fairly large producers of sulphuric acid, and in many cases they are selling their surplus output to smaller gasworks which are not direct producers. Thus, between gasworks and gasworks there probably exists a spirit of camaraderie, which prompts the larger undertakings to give a certain amount of preference to their smaller colleagues in industry. Acid manufacturers pure and simple, therefore, have to adopt some method of meeting this situation. On the other hand, the concession to the gasworks may be the result of a little mutual give and take, for acid manufacturers are undoubtedly anxious to obtain the gasworks' raw material on as advantageous terms as possible. One is tempted, however, to think that if any such understandings exist it would be far better for both parties if business were conducted on a common footing. For instance, the gasworks could well do without any concession in the way of price, if they received a *quid pro quo* in the way of the sale price per unit of sulphur for their spent oxide.

## Benzol as a Motor Fuel

THE result of the 10,000-mile test of benzol as a motor fuel may be accepted certainly as satisfactory, if not as finally conclusive. The standard car of a well-known make that was used was driven throughout by the makers' own men, and was constantly under the supervision of experts appointed by the Institute of Automobile Engineers and the Automobile Association. The distance of 10,000 miles, over ordinary touring roads, was completed within sixty days. The motor spirit conformed to the specification that the National Benzol Association is endeavouring to get recognised as a standard. The average mileage per gallon worked out at 24·57. At its highest the mileage reached 27·71 per gallon over a distance of 115·5 miles, and the lowest was 18·56 over 129·98 miles, while a fair average touring speed of 23·46 miles an hour was maintained throughout. When the engine was dismantled at the close of the test no measurable wear was detected in any of the parts, nor was there any indication of overheating or discoloration on the polished cylinders. Generally it was found as the result of measurement of the frictional surfaces that the wear throughout was normal.

## The Calendar

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| Jan. 5 | Society of Chemical Industry (London Section): "Chemical Industries in Germany." Papers by E. V. Evans, and G. S. Walpole. | Chemical Society, Burlington House, Piccadilly. 8 p.m. |
| 7 | Birmingham and Midland Institute. Scientific Society Annual Soirée. | The Institute, Birmingham. |
| 8 | Society of Chemical Industry (Bristol and South Wales Section): "The Chemical Technology of the Tannins." M. Nierenstein, Dés.Sc. 7.30 | Chemical Department, Woodland Road, The University, Bristol |
| 9 | Society of Chemical Industry (Manchester Section): "A New Instrument for the Measurement of Vapour Tension." H. Moore, M.Sc. 7 p.m. | Grand Hotel, Manchester. |
| 13 | Society of Chemical Industry (Edinburgh and East of Scotland Section): Informal Meeting. | Edinburgh. |
| 15 | Association of Engineering and Shipbuilding Draughtsmen (Chesterfield Sub-Branch): "Gas Cylinders." F. S. Marsh, M.S. 7.30 p.m. | Grammar School, Chesterfield. |
| 15 | Society of Dyers and Colourists (Bradford Junior Branch): "Utility of General Science to the Dyer." Dr. L. L. Lloyd. | Bradford. |

# 1919: A Retrospect

## Notable Developments in Chemical Science, Industry and Engineering

THE year 1919 was notable for the extraordinarily high cost of all kinds of material and of labour, and the great uncertainty as to market movements. Coal was often difficult to obtain, and was commonly found to be mixed with a remarkably large proportion of incombustible matter. Its price increased to an alarming figure. Transport difficulties continued throughout the year, and the great railway strike which began on September 27 and was settled on October 5 retarded the progress towards resumption of normal conditions. Shipping facilities gradually improved, but congestion at the various docks caused much delay and dissatisfaction. Wages generally continued on the upward grade, and machinery and constructive material were not only very costly but often could only be obtained after very long periods of waiting. Continuance of the civil war in Russia kept trade with that country at a very low ebb, and the Russian platinum deposits were reported to be lying unworked. Nevertheless, most industrial undertakings, except those closed as a result of the cessation of war, contrived to accommodate themselves to the unusual conditions, and to carry on fairly profitably.

### Organisation

In reviewing events of importance which occurred in the chemical world during the past year reference must first be made to the Chemical Industry Club and to the Chemical Engineering Group of the Society of Chemical Industry. The Club was born during the war, but held its first annual dinner in October last. At that date it had a membership roll of 650, which has since been considerably enlarged, and it is doing important work for chemists generally. The Chemical Engineering Group held its inaugural meeting in March, and has also become firmly established. The founders of both are to be congratulated upon the success which has attended their efforts. At the Club dinner Sir William Pope referred to a national scheme for amalgamating the activities of the different chemical societies, and to the provision of a Club in connection with that scheme, and Mr. Coley said that the existing Club is ready to associate itself with the national scheme as soon as that is consummated.

The Federal Council for Pure and Applied Chemistry carried out some important work during the year, and the Iron and Steel Institute joined the Council. Some useful action was taken with regard to increasing certain professorial salaries, and a good deal of attention was given to the question of providing a common meeting house for all societies associated with chemical science, and to promoting closer union between them. Professional chemists who wish to keep themselves properly in touch with all that is being done in connection with chemistry are handicapped at the present time by having to be members of several societies in addition to subscribing to one or more weekly publications, thus much overlapping and repetition occur. It should be possible to find some means of providing one staff and one building to meet the requirements of all classes and grades of chemists.

The necessity for better organisation was emphasised by Sir William Pope at the September meeting of the British Association when he pointed to the danger which threatens us in the great general mobilisation of the German scientific industry which is being quietly effected. Our Allies are evidently alive to the danger, for in July an Inter-Allied Chemical Conference was held in London in connection with the annual meeting of the Society of Chemical Industry, at which it was agreed that an "International Confederation of Associations for Pure and Applied Chemistry" should be formed. Belgium, the U.S.A., France, Italy and the United Kingdom were represented at the Conference, and it was resolved that the next meeting should be held in Italy in June next. A list of rules was drawn up and adopted.

### Coal

Several strikes and threats of strike occurred in the coal-mining industry. Wages were increased and the hours of work reduced. The Coal Commission, of which Mr. Justice Sankey was chairman, issued a number of separate reports, each put forward by a different section of the Commission. Mr. Justice Sankey's report favoured State ownership of the mines. The miners' representatives demanded nationalisation of the industry and a share in administration for the miners, while a third section was opposed to nationalisation. Sir Arthur Duckham, a member of the Commission, recommended the national acquisition of mining rights and the granting of leases to suitable organisations controlled by representatives of the staff, the workers, and the shareholders. The Government decided against nationalisation, but proposed to limit the profit per ton of coal sold. Discussion of the Coal Bill by Parliament was, however, adjourned.

### Colloidal Fuel

American engineers have solved the problem of producing mixtures of oil and pulverised coal, in which the coal remains in suspension for several months. Coal dust to the extent of 30 to 40 per cent. is added to oil mixed with 1 per cent. of "fixateur," but the composition of the fixateur is not disclosed. Low grade coal can be utilised in this manner, and the mixture can be passed through pipes like ordinary oil fuel. Much important work with colloidal fuels containing pulverised coal was carried out by the Submarine Defence Association of New York.

### Gas Supply

The sale of gas continued to be restricted by Government Order until the latter part of November, but the closing weeks of the year saw large increases in the output of gas from those undertakings which were able to meet the demand. Some undertakings were seriously affected by the shortage of coal, and in certain instances, where vertical retorts were installed, complaint was made that the coal delivered by order of the Coal Controller was not suitable for use in verticals. The report of the Fuel Research Board (of which Sir George Beilby is chairman) was published during the year. The chief recommendation made by the Board was that gas should in future be sold by thermal units, one unit to be 100,000 B.Th.U. To arrive at the units consumed the number of cubic feet registered by the consumer's meter is to be multiplied by the declared gross calorific value per cubic foot of the gas. It was also proposed that the proportion of inert constituents of the gas should be limited to 20 per cent. for two years, then to 18 per cent. for the two succeeding years, and finally to 15 per cent. It was further suggested that the minimum gas pressure in distribution pipes of two or more inches diameter should be equal to two inches of water. These recommendations are to form the basis of a Bill to be introduced into Parliament at the earliest possible opportunity.

When the railway strike commenced a Government Order was issued making it an offence to supply gas having a higher calorific value than 425 B.Th.U., but the Order was withdrawn a few weeks after the strike ended. Gas shareholders and stockholders in general continued to receive

very slender dividends owing to the fact that the high cost of labour and of coal resulted in high charges for gas, and as many statutory gas undertakings are operated under a sliding scale, they are compelled to reduce the dividend *pro rata* every time the price of gas is raised. In many cases the dividend would have been reduced to vanishing point but for the provisions of the "Temporary Increase of Charges Act," which prevented it from falling below about 3 per cent. Bills to adjust standard prices to existing working costs are now being drawn up.

### Petroleum

Great activity prevailed during the year both at home and abroad in the petroleum business, and much fresh capital was raised for the purpose of exploring new fields for oil and of erecting new refining plants. Oil as a fuel in place of coal on steamships was extensively adopted, and it has become imperative, in view of the comparative rapidity with which oil wells become exhausted, that new sources of supply should be discovered. In England the search for oil in Derbyshire resulted in a flow of about 260 gallons per day for several months from the boring at Hardstoft, and boring is being continued. Other borings in Derbyshire have not yet disclosed the presence of oil in important quantity. Oilfields of England, Ltd., obtained a licence to bore for petroleum near Newark, in Nottinghamshire. English Oilfields, Ltd., is endeavouring to establish a large and important industry in Norfolk by working the extensive beds of shale which have long been known to be in existence there. It was said that the oil obtained from the middle shales in Norfolk is practically free from sulphur. The five shale oil companies of Scotland were taken over by the Anglo-Persian Oil Co., and a large oil refinery is in course of erection for the Anglo-Persian Co. at Swansea. The productivity of the Persian oil wells continued to be very great.

The Burmah Oil Co., which is associated with the Anglo-Persian, continued in very successful operation, although some of its borings showed disappointing results. The London & Thames Haven Oil Wharves Co., the leading petroleum refining and storage company for London, absorbed the London Oil Storage, which was an important undertaking dealing with turpentine, vegetable, and edible oils. In Egypt, in Trinidad, in Canada, and in all the older fields oil continued to be found in large quantities. In Russia heavy losses by fire and by war were incurred. It was proved that petroleum is very extensively distributed throughout the world, but the quantity as yet disclosed is not in many cases sufficient to cover the cost of boring. The necessity for further research into the chemistry of petroleum was recognised in the industry, and three British oil companies, together with Lord Cowdray, the Hon. Clive Pearson, and Mr. Deterding, presented the sum of £210,000 to Cambridge University for extension and maintenance of its School of Chemistry.

### Dyestuffs and National Safety

British Dyes, Ltd., amalgamated with Levinstein, Ltd., to form a company known as the British Dyestuffs Corporation, Ltd., with Lord Moulton as its head, and the British Government took up a substantial holding in the corporation. By the terms of the Peace Treaty the Allies have the right to 50 per cent. of the stock of dyes which existed in Germany on August 15, 1919, and 25 per cent. of all colours produced during the ensuing five years in Germany. In his address to the Colour Users' Association at Manchester, Lord Moulton said that if our dyestuff industry did not within five years become strong enough to hold its own against the chemistry of Germany it did not deserve assistance. The production of dyes by the two amalgamating companies reached a figure of more than four times the pre-war production. A conference on Dyestuffs and Synthetic Drugs was held in London in connection with the annual meeting of the Society of Chemical Industry. In his address to the Conference Dr. Levinstein pointed out that the German dye factories are capable of turning out great quantities of dyestuffs and intermediates one day and stupendous quantities of poison gas the next, and that the world would not be safe for peaceful people if the Germans retained a monopoly of dyestuff manufacture. President Wilson, in a telegram to Congress, also referred to the close relationship of dye manufacture with that of explosives and poison gases. The problem of "Intermediates" manufacture received considerable attention, and articles on the subject, which appeared in our pages towards the end of the year, clearly showed that the question whether it is profitable or possible for the larger carbonising concerns to become producers of the half-way products is of a complex nature, and without extended practical experience it is difficult to give any definite opinion of the subject.

### Sugar Production

A long and valuable Report on sugar production was presented at the annual meeting of the Society of Chemical Industry by a Committee which had been appointed by the Society. A conference was held in London to discuss the report. The report pointed out that the British Empire has about 3½ million acres under sugar, mostly cane. This is more than double the acreage held under sugar by Germany and Austria-Hungary together, yet less sugar is produced. As beet yields barely two tons of sugar per acre, and sugar cane should yield over four tons of sugar per acre, it was obvious, said the Report, that something must be wrong with our methods. Taking the British Empire as a whole it is evident that beet will not compare favourably with cane as a source of sugar; and, as Mr. Macdonald remarked in the discussion, a supply of fuel is required for manufacturing sugar from beet, whereas the sugar cane supplies its own fuel.

### Potash

Throughout the year potassium compounds remained scarce and expensive, but large quantities of crude potash salts were extracted from the mines of Alsace. The British Government acquired from Germany a quantity of potash salts in exchange for food, and it was arranged that a considerable proportion of this should be distributed for agricultural purposes. The work which was accomplished in America in connection with the recovery of potash from the flue dust of cement works was described in articles contributed to our columns in October last by Dr. Wilson. In the same month Messrs. Rossiter and Dingley dealt with the subject of potash extraction from British blast furnaces in a Paper read before the Birmingham Section of the Society of Chemical Industry, and showed that potash is usually present in the iron ore in larger quantity than in the coke or the limestone. Potash recovery was in some cases profitable at war prices, but it is doubtful whether it will remain profitable when the potash market returns to normal peace conditions. A South African Nitrate and Potash Corporation of Johannesburg was formed to extract from the shale deposits in the districts of Prieska and Hay the 3 to 10 per cent. of nitrate of potash which they contain.

### Alcohol for Power and Traction

The Report of the Inter-Departmental Committee, of which the late Sir Boverton Redwood was chairman, was issued in June. The Committee recommended the formation of a permanent Government organisation to initiate and supervise work on the production and utilisation of power alcohol, and urged that restrictions which impede its use should as far as possible be removed. It is interesting to note that experts recommended the utilisation of a benzol-alcohol mixture as a fuel for motor vehicles, and a good

deal of attention was given to the problem of producing synthetic alcohol from the ethylene contained in ordinary coal gas.

### Amalgamations

In addition to the amalgamations in the dye and oil industries, to which reference has already been made, the following important changes occurred: The firm of Lever Bros. continued to pursue its policy of absorbing or controlling kindred undertakings, and purchased the soap businesses of Joseph Crosfield & Sons, and of Wm. Gossage & Sons, from Brunner, Mond & Co. The same firm also obtained control of the business of Price's Patent Candle Co. Brunner, Mond & Co. purchased nearly all the shares of Buxton Lime Firms Co., while Nitrogen Products & Carbide Co. amalgamated with the Alby United Carbide Factories, and British Glass Industries absorbed the Queenborough Glass Bottle Works and the British & Foreign Bottle Co.

### Obituary

The following is a list of some of those associated with chemical science, and who were widely known and esteemed, who died during the year: Professor Adrian Brown, Sir John T. Brunner, Sir William Crookes, Mr. Thomas Fairley, Professor George Carey Foster, Dr. A. G. Vernon Harcourt, Lord Rayleigh, Sir Boverton Redwood, Sir Peter Squire, Dr. H. C. Greenwood and Mr. J. C. Umney.

### The Year's Legacies

The year left behind it the foundations of many new industrial enterprises initiated during its life. It left an army of scientifically trained men released from war work free to grapple with the problems of life, and motion, and matter. It left a number of powerful corporations rendered vastly more powerful by amalgamations and greatly increased funds, and commissioned to probe the earth in every continent for oil and coal and other materials of everyday service. It left scientific associations more numerous, better organised, and more strongly supported than ever before. It witnessed the birth of THE CHEMICAL AGE, and has left with us the task of urging the importance of development in chemical science and chemical industry—a task which will increase in interest as years go by, particularly in view of the fact that great and continuous developments may be anticipated in all branches of this indispensable industry.

# The Nitrogen Industry in 1919

**By E. B. Maxted, Ph.D., B.Sc.**

As in other branches of chemical industry the outstanding feature of the past year has been the publication of patents delayed under war restrictions. Commercially, of course, the year has been marked by an enormous decrease in the quantities of nitrogenous bodies, consequent upon the termination of the war.

Looking back on the war-time developments in the industry under consideration, as far as can be done in the light of information published, the general trend of progress would, as can well be understood, appear to be in the direction of extending and systematising the scientific control of known processes with a view to efficient mass production, rather than in the introduction and development of novel methods of manufacture. There are, of course, many deviations from this general trend, among which may be specially mentioned the production of nitrates, such as ammonium nitrate and calcium nitrate, by the interaction of solutions of appropriate salts with sodium nitrate, the large-scale production of sodium cyanide by the Bucher process, and the various war-time measures adopted in Germany as a consequence of the shortage of many raw materials. From the point of view of the development of comparatively new industries, particular attention is directed to the growth of the German synthetic ammonia and cyanamide factories, as well as to recent developments in their relation to the State. The establishment of a more adequate dye industry in this country, although to a certain extent concerning nitrogenous substances, does not fall within the scope of the present section.

It is proposed in the following summary to group the various work which has been published during the past year into three main divisions, comprising nitric acid and nitrates, ammonia and ammonium salts, and nitrogen fixation, respectively. It is not, of course, possible to refer to every Paper published, and the following review must be regarded as a general survey rather than as a complete list of publications.

### Nitric Acid and Nitrates

A considerable number of Papers and patents relating to this group deal with the absorption of nitrous gases, the oxidation of ammonia, and the manufacture of nitrates by double decomposition. An important Paper on the theory of nitric acid absorption towers has been published by J. R. Partington and L. H. Parker.[1] Data are given for calculating the size of tower required for a given performance, and interesting comparative figures are included relating to various types of tower packing. C. Toniolo[2] proposes to cool the liquid used for absorbing nitrogen oxides to a temperature near its freezing point, by which means absorption is accelerated. The process is carried out in a series of towers, through which nitrous gases and water are passed in counter current. Quinan[3] describes the use of porous diaphragms, over which water is distributed, the nitrous gases being passed through these under such conditions that no appreciable percolation of the liquid phase takes place.

Passing to the manufacture of nitric acid by the oxidation of ammonia, G. B. Taylor and J. H. Capps[4] have published highly interesting data on the toxic effect of phosphine on the process in presence of platinum. Small traces of phosphine, of the order of two volumes per hundred million volumes of the gas mixture undergoing reaction, were found to reduce the yield of nitric acid by several parts per cent., while with larger proportions, the inhibitive effect was correspondingly greater. The result is of special importance in connection with the oxidation of ammonia from cyanamide. Acetylene, also hydrogen sulphide in low concentration, have no direct inhibitive effect. W. S. Landis[5] discusses the oxidation of ammonia in presence of an electrically heated platinum net, with special reference to the United States Government plant at Muscle Shoals. The yield of nitric acid is about 90 per cent., the optimum rate of flow being about 6 lb. of ammonia per square foot of catalyst per hour. Comparison may be made between the results recorded by Landis and those obtainable with the somewhat similar plant developed by the British Munitions Inventions Department,[6] also with the figures

[1] *J. S. C. I.*, 1919, 38, 75T.
[2] Brit. Pat., 121,635.
[3] Brit. Pat., 131,029.
[4] *J. Ind. & Eng. Chem.*, 1919, 11, 27.
[5] *Chem. & Met. Eng.*, 1919, 20. 470 (ex *J. S. C. I.*, 1919, 38, 410A).
[6] *See*, for instance, J. Partington. *J. S. C. I.*, 1918, 37, 337R.

published by C. L. Parsons[1] for a converter containing platinum not maintained at the required temperature by means of the heat of the reaction between ammonia and air.

The preferential condensation of reaction water from the gaseous products from ammonia oxidation is the subject of patent applications by J. R. Partington[2] and by the author.[3] In the former specification the gas mixture is cooled rapidly to below 30°C., while, according to the latter, the condensation of reaction water is effected by rapidly cooling to, say, 60°C., when the bulk of the reaction water separates, the oxides of nitrogen with a small quantity of water being subsequently condensed at a low temperature.

The reaction between liquid nitrogen peroxide, water and oxygen, with formation of concentrated nitric acid, by taking advantage of the separation of the mixture into two liquid phases (*see also* Brit. Pat. No. 4,345 of 1915) forms the subject of a patent taken out on behalf of P. A. Guye,[4] while the author and T. A. Smith[5] describe the preparation of highly concentrated nitric acid without separation of the mixture into layers, by employing a large excess of nitrogen peroxide.

Several highly interesting patents for the preparation of nitrates by double decomposition with sodium nitrate have been published during the year. For the manufacture of ammonium nitrate, F. A. Freeth and H. E. Cocksedge[6] allow sodium nitrate to react in aqueous solution with ammonium bicarbonate under such conditions that sodium bicarbonate is precipitated, the residual liquid being concentrated and cooled, when ammonium nitrate crystallises out. The manufacture of ammonium nitrate from ammonium sulphate and sodium nitrate has been described by D. Tyrer.[7] The bulk of the sodium sulphate formed separates out at once from the hot concentrated solutions employed, the greater part of the remaining sulphate being precipitated by means of calcium nitrate. After further concentration and cooling, the ammonium nitrate is allowed to crystallise out. A method for the preparation of ammonium nitrate from ammonium sulphate, without the use of calcium nitrate, forms the subject of a further patent by F. A. Freeth and H. E. Cocksedge.[8] For a somewhat similar process in presence of nitre cake, reference may be made to a specification of H. S. Denny and A. T. Jefferies,[9] while in connection with the use of ammonium nitrate as a fertiliser it is to be noted that the mixture of this with potassium chloride, obtained by evaporating solutions of the salts, is far less deliquescent than ammonium nitrate itself.[10]

The preparation of calcium nitrate from calcium chloride and sodium nitrate is described by S. Smith and the Ammonia Soda Co., Ltd.,[11] the separation of ammonium chloride from the resulting solution being effected by concentration.

Mention may be made here of the general position of the Chile nitrate industry. The termination of hostilities was naturally accompanied by an enormous decrease in the demand for sodium nitrate, with consequent shutting down of many of the oficinas. With regard to the selling price of the nitrate, the Chilean Association of Nitrate Producers agreed on a rate of 10s. per quintal (101 lb.), which was afterwards raised to 10s. 6d. A process which claims considerable economy in the production of sodium nitrate has been put forward by Dr. Charme.[12] The published details are however, too meagre to justify any criticism of the claims made. An exceedingly clear account of the extraction methods at present in general use has been given by F. G. Donnan.[13] Finally, thepossibility of utilising the important South African deposits of potassium nitrate has received considerable attention and resulted in the formation of a company for this purpose.[1] These deposits, of considerable extent, are in the districts of Prieska and Hay.

[1] *J. Ind. & Eng. Chem.*, 1919, 11, 541.
[2] Brit. Pat., 131,942.
[3] Brit. Pat., 127,343.
[4] Brit. Pat., 131,336.
[5] Brit. Pat., 126,704.
[6] Brit. Pat., 12,410, of 1915.
[7] Brit. Pat., 125,621.
[8] Brit. Pat., 126,678.
[9] Brit. Pat., 131,017.
[10] German Pat., 309,608.
[11] Brit. Pats., 10,595/15, and 1,059/16.
[12] See *Chem. Age*, 1919, 1, 505.
[13] *Chem Age*, 1919, 1, 634.

### Ammonia and Ammonium Salts

It is not proposed to review here work on synthetic ammonia, this being dealt with under nitrogen fixation.

W. Grahmann[2] has investigated the velocity with which ammonia is liberated from commercial calcium cyanamide by water at various pressures and by solutions of alkaline hydroxides and carbonates, these acting, as would be expected, as accelerators.

Passing to the manufacture of ammonium salts, other than the nitrate, which has already been dealt with, E. A. Le Sueur[3] describes the preparation of ammonium perchlorate from a solution of ammonium sulphate and sodium perchlorate, by concentrating at a temperature slightly higher than that at which a separation of hydrated sodium sulphate occurs, when ammonium perchlorate crystallises out. An alternative procedure for the preparation of the same salts, also from ammonium sulphate and sodium perchlorate has been described by Bailey, Denny and Dunk.[4]

Various processes for the manufacture of ammonium sulphate have been patented in the course of the year. G. N. Vis[5] proposes to saturate an ammoniacal solution of sodium bisulphate with carbon dioxide, with production of ammonium sulphate and sodium bicarbonate in a manner analogous to the Solvay ammonia-soda process. The utilisation of nitre cake for the manufacture of soda-ammonium sulphate and the separation of this double salt into its constituents has been studied by H. M. Dawson.[6] F. Fischer and H. Niggemann[7] have described the precipitation of the same double compound as a continuous process. It may be noted that, owing to the sulphuric acid shortage in Germany,[8] ammonium sulphate was made by interaction of ammonia with calcium sulphate in the presence of carbon dioxide and water.

Turning to the recovery of ammonia during the carbonisation of fuel, a highly interesting account of the progress which has been made in this most important subject is contained in the Report for 1918 of the Chief Inspector on Alkali, &c., Works, to which special attention is directed. With reference to the effect of steam, carbon dioxide and other gases, on the yield of ammonia which can be recovered from coal and coke, some figures by H. Salmang[9] may also be noticed. The effect of adding calcium carbonate and iron oxide was also investigated. Finally, the blue coloration frequently observed in commercial samples of ammonium sulphate has been discussed by A. Thau,[10] who brings forward interesting evidence that this is due to Prussian blue.

### Nitrogen Fixation

The termination of the war and the Allied occupation of the Rhineland have made it possible to obtain a trustworthy account of the magnitude of the German synthetic ammonia works at Oppau and Merseburg. The following estimated figures are given in the Report of the Departmental Committee on Sulphuric Acid and Fertiliser Trades, 1919, for the German production of ammonia by the Haber process and for the production of cyanamide for 1913 and 1917 respectively. The figures refer to tons of nitrogen fixed :—

| | 1913 | | 1917 |
|---|---|---|---|
| As Synthetic Ammonia ..... | 4,000 | ... | 100,000 tons |
| As Calcium Cyanamide ..... | 6,000 | ... | 80,000 tons |

[1] *Chem. Age*, 1919, 1, 521 ; also *J. S. C. I.*, 19, 38, 452A.
[2] *Zeitschr. f. Electrochem.*, 1918, 24, 385.
[3] U.S. Pat., 1,284,380.
[4] Brit. Pat., 125,677.
[5] U.S. Pat., 1,294,526.
[6] *J. S. C. I.*, 1919, 38, 98T.
[7] *Ges.-Abhandl. zur Kenntnis der Kohl*, 1917, 1, 285 (ex *J. S. C. I.*, 1919, 38, 532A).
[8] *Oesterr. Chem. Zeit.*, July 1, 1919 (ex *J.S.C.I.*, 1919, 38, 278R).
[9] *Zeitschr. f. angew. Chem.*, 1919, 32, 148.
[10] See *Chem. Age*, 1919, 1, 459.

It is stated[1] that after the battle of the Marne the German Government advanced M.30,000,000 to the Badische Anilin und Soda Fabrik for extensions to synthetic ammonia plants and, in addition, erected extensive cyanamide plants at Wittenberg, Chorzow and Piesterloh. The production of nitrogen compounds in Germany is now in the hands of the recently-formed Stickstoff-Syndikat G.m.b.H., which comprises, in addition to the Badische Company, the two other great groups of producers, representing by-product ammonia and cyanamide respectively. In Great Britain, with special reference to cyanamide, the amalgamation of the Nitrogen Products and Carbide Co., Ltd., with Alby United Carbide Factories, Ltd., may be noted.

Passing to a consideration of the technical work relating to nitrogen fixation, H. C. Greenwood and A. T. S. Zealley[2] have published details of an apparatus for automatically estimating small amounts of oxygen in the gas mixture used for the synthesis of ammonia, while E. K. Rideal and H. S. Taylor[3] describes a corresponding instrument for the estimation of traces of carbon monoxide. The production of ammonia by a reaction of the nitride-hydride intermittent type forms the subject of a patent application by the Verein Chemischer Fabriken in Mannheim,[4] barium nitride being used as the contact body. This is treated, at an elevated temperature and pressure, with hydrogen and nitrogen alternately, in the usual way.

The direct synthesis of nitric oxide is represented by two patents of E. K. Scott and F. Howles,[5] which have been published in the course of the year. The specifications relate to the use of pilot sparks and of furnaces adapted for three-phase current. A furnace in which the arc is spread by the combined action of the air blast and an electromagnet has also been described by H. Andriessens.[6]

A considerable number of papers have been published relating to the production of alkali cyanides by interaction of carbon, an alkali and nitrogen in the presence of iron. The description of a large-scale plant at Saltville, Virginia,[1] contains many interesting details with respect to the methods adopted in practice. The coke is ground to the required size (150-200 mesh) and is then mixed with the iron and soda, the mixture being briquetted by extrusion while in a moist and hot condition. A serious difficulty was encountered in the rapid deterioration of the iron retorts employed, but this was met to some degree by substituting retorts constructed of nichrome. A novel feature consisted in the extraction of the cyanide, without destroying the structure of the briquette, by means of liquid ammonia. Other[2] results in connection with the same process have been published by Y. Morimoto,[3] who re ports that suitable proportions of iron, carbon and sodium carbonate are in the ratio of 2 : 2 : 1, a suitable temperature being 850-900 C. Under these conditions, a yield of cyanide equal to 75 per cent. of the theoretical was obtained in a horizontal furnace. The use of siliceous iron oxide was not conducive to success. According to a patent granted to F. J. Metzger, the briquettes resulting from the reaction are treated with a solvent, such as a mixture of alcohol and water, in which the residual alkaline carbonate is insoluble, any alkaline hydroxide being previously converted into carbonate. An electric resistance furnace for use in the cyanide process has been described by A. R. Lindblad, the charge itself acting as the resistance. Finally, it may be noted that R. Williams has found substances, such as petroleum coke, to be more satisfactory than other forms of carbon for the manufacture of the briquettes required for the process, this being possibly on account of its porous structure.

# Chemical Trade in 1919

## By Chas. Page & Co., Ltd.

THE past year has been very eventful in the Chemical Trade and in many cases some wide fluctuations in values have occurred. Taking it on the whole it has been a difficult and anxious year for the trade.

Immediately after the Armistice values of practically every product began to slump badly, and as a consequence business fell away to very moderate proportions. This was largely accounted for by the dropping off of War orders, nervousness on the part of foreign buyers, and the uncertainty prevailing as to the time it would take for industries generally to get back to their normal course of trade. A further feature was the fact that many people feared an early resumption of German competition. Markets continued generally to decline during the early months, but in May it was apparent that a revival was slowly setting in ; stocks were beginning to be absorbed, and in a number of cases the decline in values were not so marked, and the keen American competition which has been experienced for some months began to slacken somewhat. Business continued steadily to improve, and a large number of export orders came into the market with the result that by July or August the majority of the manufacturers in the country were well occupied with orders. Prices also began to advance in a number of directions, and the upward movement has continued steadily until the time of writing.

At the present time practically all works in this country have sold their outputs for many months ahead, and there are still a large number of buyers anxiously endeavouring to cover their requirements. The market values on materials which are being imported from America continue on the up grade owing to the higher markets in America and adverse exchange. The threatened German competition did not materialise to any extent, and the few parcels that did reach this country were in the main stocks held in Germany by various merchants, and as these became absorbed prices steadily advanced in Germany. It is our opinion that there need be no fear of any strong German competition for at least two years to come, as owing to the lack of fuel and high prices of raw materials and the shortage of labour it is hardly possible that Germany will be able to compete at all strongly for some considerable time ahead unless for one or two special products.

During the year imports have been restricted for quite a number of materials classed under the heading of key industries, and although all imports are for the moment free due to the recent legal decision, it is anticipated that legislation will be introduced at an early date in order to reimpose these restrictions. There is at the present moment a very serious shortage of supplies for a large number of products, and manufacturers are unable to meet the demand. It is our opinion that the trade can look forward to a very busy and prosperous year, providing always, of course, that works are not too encumbered by labour and fuel difficulties. During the past year, of course, production has been greatly hampered in many directions by the coal and railway strikes, while the shortage of wagons and congestion at the various ports undoubtedly tend to retard production to a large extent. Now that the trade, however, has successfully got over the transition period there is every hope for confidence in the future, and doubtless every effort will be made by works to catch up with the arrears which have accumulated during the last few months.

[1] *Zeit. f. angew. Chem.*, March 21, 1919 (ex *J. S. C. I.*, 1919, 38, 189R).
[2] *J. S. C. I.*, 1919, 38, 87T.
[3] *Analyst*, 1919, 44, 89.
[4] Ger. Pat., 311,234 (ex *J. S. C. I.*, 1919, 38, 462A).
[5] Brit. Pats., 126,058 and 126,080.
[6] *Zeitschr. f. Elektrochem.*, 1919, 25.255.

[1] *Chem Age*, 1919, 1, 656.
[2] Brit. Pat., 133,095.
[3] *J. Chem. Ind. Tokio*, 1918, 21, 881 (ex *J. S. C. I.*, 119, 38, p. 10A).

ACETONE has been a very inactive market, and the price has been in the main without change, due to the fact that the Government have large stocks of material, and the Government fixed prices are adhered to.

ACIDS have been a variable market.

ACETIC started the year at approximately £160 per ton in January, from which date it declined steadily to about £60 per ton for 80 per cent. in June, and thereafter was a fairly steady market, and is now a little higher at about £67 10s. per ton.

FORMIC ACID has been in extremely short supply, but it is now being produced in this country in increasing quantities and fair supplies are obtainable. The price, however, would seem somewhat high at about £110 per ton.

LACTIC ACID has declined in price, and there has been no felt shortage.

TARTARIC ACID declined in sympathy with other products during the early months of the year, but is now a firm market, and English makers are very heavily committed, while higher prices are being quoted for forward by foreign producers.

ALUM has been a fairly steady market, but the price has recently advanced, and makers are now so heavily sold that they cannot promise delivery until well into 1920.

SULPHATE OF ALUMINA has also been a fairly steady market.

Business in AMMONIUM SALTS has been decidedly interesting, and values in all cases are exceptionally firm. Advances in price have been made by the manufacturers on a number of Salts, notably Chloride, Carbonate, and SALAMMONIAC. Manufacturers are all extremely busy especially in regard to SALAMMONIAC, delivery of which connot be given until well into 1920 for new business.

ARSENIC has been an extremely fluctuating market starting the year at about £85 per ton, from which figure it declined to as low as £30 per ton in May last, from which date it has steadily advanced until the material is now standing at £65 per ton, with a firm market.

BARIUM SALTS have been on the whole inactive, and there are still large stocks unabsorbed of Nitrate of Barium, and the price has steadily declined until the material can be obtained to-day at about £46 per ton. Chloride has been a declining market, although during the last few weeks of the year it has become slightly firmer, and is now a steady market at £22 per ton.

BLEACHING POWDER has been a variable market. In the early months of the year it was standing at approximately £16 per ton, but afterwards declined to about £12 10s. per ton in June, at which figure there were very few buyers. There were large Government stocks thrown on the market, which had the effect of depressing the trade, while the general stagnation in the early months of the year resulted in very heavy accumulations of stock. The position during the second half of the year was entirely changed, and to-day the market is very firm at about £18 per ton, with prompt material practically unobtainable and makers well sold for several months ahead.

EPSOM SALTS have not varied very much in price during the year, but are now inclined to be much firmer owing to the present comparative scarcity.

FORMALDEHYDE was practically unobtainable in the early months of the year, but later supplies began to arrive from America at about £125 per ton. Recently the market has advanced by leaps and bounds, and as much as £200 per ton has been paid, and it is difficult to see where any ready relief can be looked for.

IRON SULPHATE has been a slow market, and has varied from about £9 per ton down to about £4 10s. per ton at the present time, and full supplies of this material are still available.

LEAD SALTS have been fairly active all through the year, although the value on the whole shows a large decline.

ACETATE has ranged from £150 in January to £83 per ton at the end of the year, the decline being in the main caused by the fall in ACETIC ACID, and considering the recent value of the metal the value to-day can only be considered as extremely moderate.

LEAD NITRATE has fallen from £70 per ton in January down to £54 per ton in June, and it is to-day standing at about £62 per ton, with only a moderate business passing.

LITHOPONE has been an interesting market, and American was obtainable at the beginning of the year at about £52 per ton, from which figure it declined to about £40 per ton in June; shortly after this date the market advanced slightly and imports were restricted. Towards the end of the year it became impossible to import American material owing to the adverse exchange and the competition of Dutch and German makes, the demand, however, has easily kept pace with the supply, and we close with a firm market at about £45 per ton.

POTASSIUM SALTS have been variable.

BICHROMATE was an easy market in the early part of the year, but closed firm and scarce at about 1s. 6d. per lb.

CARBONATE was very scarce in the early part of the year at about £150 per ton on the basis of 80 per cent. There is not so much stringency, however, as in the past, and the market may be taken to-day at about £100 per ton.

CHLORIDE has been a continually dull market throughout the year, and has slowly declined from about 1s. 10d. per lb. down to the present level of 1s. per lb.

YELLOW PRUSSIATE has ranged from 2s. 8d. per lb. at the commencement of the year, and is now standing at 2s. per lb., with a fair market. Import of this material has been restricted, but small quantities of Continental make have been allowed in from time to time.

CAUSTIC POTASH has been extremely scarce, and is under control, but supplies of Continental make are now expected to arrive at about £100 per ton.

PERMANGANATE has varied from 8s. 3d. per lb. to the present level of 3s. 9d. per lb. Trade has been very active of late on this article.

SODIUM PRODUCTS have varied according to the article.

ACETATE has been weak for most of the year, but is now in better demand at about £52 per ton.

ARSENIATES were stagnant in the early part of the year, but are now very much better, and the figure may be taken at about £65 per ton for 60 per cent.

BICARBONATE has been in active request during the latter months of the year, and is now badly wanted on export account at about £12 per ton.

BISULPHITE has been extremely active during the later months of the year, and makers are now very heavily sold, and to-day's value may be taken at about £35 per ton.

CHLORATE has been a steadily declining market throughout the year, and from the value of 1s. per lb. it has dropped down to the present value of 6d. per lb.

CAUSTIC SODA has been a peculiar market, starting the year at about £30 per ton, the material steadily declined in value until the end of June it could be obtained from resellers at about £17 per ton, and from that date onwards it has steadily improved until now it is extremely scarce, and the value may be taken at £25 to £26 per ton for 70 to 72 per cent.

HYPOSULPHITE has varied very little during the year, but is now extremely scarce, and higher prices may be looked for.

NITRITE has been a fluctuating market, and has varied from £69 per ton in January down to £55 per ton in June, since when it has steadily advanced, and to-day the value may be taken at £65 per ton, and the material being extremely scarce it is expected to go higher.

SODIUM PHOSPHATE has only been moderatively active, and has varied from £50 to the present level of £35 per ton.

YELLOW PRUSSIATE OF SODA has been a difficult market. In the early part of the year it was practically unsaleable, and the price steadily declined to 7d. per lb., the market then turned round, and has steadily improved, and to-day's value is 1s. 2d. per lb. The feature of this product has been that whereas, a year ago the article was being imported from America, it is now being sold in considerable quantities for export to that country.

SODIUM SULPHIDE was stagnant in the early parts of the year for the concentrated variety, although trade in Crystals has kept fairly steady throughout the year. The market closes strong at about £27 per ton for Concentrated and £16 per ton for Crystals.

SULPHITE has been a fairly steady market throughout the year, with a moderate trade passing.

TIN SALTS have only been moving slowly, but are now firm with an upward tendency in sympathy with the rise in the value of metal.

ZINC SALTS have been moderately active during the year, with little change in price.

CHLORIDE has moved off better, and the same may be said to apply to SULPHATE.

# Patents in 1919

THE close of the year 1919 offers an opportunity of reviewing the trend of invention in the chemical industry during the year. Such a review will be of interest to the chemist, and to the manufacturer, as indicating the probable developments of the industry in future years, few inventions being sufficiently developed to be worked on a large scale at the time patents are taken out for them. The first year of peace has given a great impetus to invention, and the number of patents applied for last year has broken all previous records.

### Catalysts, Nitrogen Fixation

One of the most outstanding features of the year has been the amount of research work and invention in the use of catalysts for promoting and facilitating chemical reactions, and much attention has been directed to the problem of nitrogen fixation and its auxiliary processes, notably by Dr. Maxted. One of the difficulties hitherto experienced in the direct synthesis of ammonia has been that of obtaining nitrogen and hydrogen of a sufficient degree of purity, and several inventions have been patented relating to the catalytic manufacture of hydrogen from water gas, and steam, and also by the steam-iron process. Some interesting processes have also appeared for obtaining pure nitrogen free from other inert gases, by the fractionation of liquid air. The actual production of ammonia by direct synthesis, however, is by no means an easy operation, and much ingenuity has been shown in overcoming the difficulties of furnace construction to resist the action of the nitrogen-hydrogen mixture, and in improving the yield of ammonia by the selection of a suitable catalyst and suitable working temperatures and pressures. As regards the catalyst, iron with a promoter such as potash, still appears to be the best, and much work has been done in devising means for freeing the iron from catalyst poisons. Other catalysts, such as osmium and uranium, have also been suggested, but it is doubtful whether any advantage will be obtained which will balance the higher cost.

Some interesting patents in this subject have recently been taken out by M. Georges Claude, who obtains a much higher yield of ammonia by the use of very high pressures, up to 2,000 atmospheres or more. If the mechanical difficulties usually considered inseparable from the use of such high pressures can be overcome, more will undoubtedly be heard of this invention, and the developments will be watched with interest no less by engineers than by chemists. Methods of absorbing the ammonia for industrial use have also been developed, and while the absorption by means of water under pressure is probably still the most generally used method, an interesting patent for minimising heat losses has recently appeared, according to which the hot compressed ammonia is absorbed by anhydrous cobaltous chloride, and released by reducing the pressure. The oxidation of ammonia to nitric acid by means of an iron catalyst has also been developed, and methods of removing the resulting gases without loss by dissociation have been worked out and patented.

The carbide-cyanamide process of nitrogen fixation has also received considerable attention, and many interesting developments have been patented, notably by Americans. The full development of the process in this country will probably be dependent on the possibility of obtaining cheap electrical energy. Much valuable work has been done on catalyst poisons and their elimination, on the hydrogenation of fats and oils, and on other organic reactions, such as the catalytic production of aldehyde from alcohol vapour or acetylene.

### Potash Supplies

The termination of the war, and the fact that supplies of potash from Germany and Alsace will again be available, may have somewhat restricted the very interesting developments in the recovery of potash from various minerals and from flue dust, but the patent literature bears witness to the fact that inventors still consider that these processes are worth working out more fully. Steady progress has been made in the improvement of chemical apparatus in general, such as in centrifugal separation and drying, filtration, gas washing, evaporation and concentration of liquids, distillation, retorts, electrolysis, &c. The shortage of supplies and continued increase in the cost of fuel has stimulated invention in the economising of fuel by extending the principle of utilising the waste heat from one chemical process for supplying the required heat in another process; other examples are seen in the inventions for regulating the working conditions in catalytic processes, so that the temperature necessary for a reaction is maintained partly or entirely by the heat generated. In gas manufacture and its auxiliary processes, the improvements in by-product recovery stimulated by the war have been extended and developed, but the inventions are too varied to be specified in detail. Progress in the manufacture of dyestuffs has been rapid, and the industry is rapidly being placed on a footing which will enable it to compete successfully with the German industry.

### The New Patents Bill

The year has been notable for the introduction of a new Patents Bill in place of the Bill withdrawn in 1917, with the object of remedying some of the defects of the Act of 1907. The Bill is open to considerable criticism from the various interests affected, and it is frankly an attempt at a compromise between those interests. Some patents have been practically suspended through force of circumstances during the war, and some have expired during that period, while others, more useful for war purposes, have brought their owners an increased return. It has long been felt, moreover, that the maximum period of 14 years is insufficient to secure an adequate return to the inventor, who has to expend a considerable part of that time in developing his invention on a manufacturing scale. As a compromise it was proposed to extend the period for patents to 16 years. Other new features relate to the disposal of patents; to the granting of licences, particularly in respect of patents for chemical products, foods and medicines; to the reduction of renewal fees to one half in certain cases; and to the extension to nine months of the time allowed for the development of the invention between the provisional and complete stages. Restrictions are proposed to protect inventors from incompetent and unscrupulous "agents." Chemists will be interested in the proposal to allow process claims only, as distinct from product claims.

Considerable advantage has been taken of the provisions of the Trading with the Enemy Acts, whereby British firms may secure licences in respect of patents held by enemy subjects, and many well-known firms have been granted such licences, notably for the manufacture of ammonia by the Badische processes, and for the manufacture of dyestuffs and intermediates.

A considerable number of applications are now being received from foreign countries under the International Convention, which were held up by war conditions, and the dates claimed under the International Convention are in many cases several years back. Inventors and manufacturers would do well to watch our Patent Literature columns and note carefully those cases which are not yet accepted, but which will eventually bear a much earlier date, and may, therefore, anticipate their own inventions.

Chemists may look backward with satisfaction on a year of substantial progress, and forward with confidence to the many problems still awaiting solution.

## The Sankey Judgment

*To the Editor of* THE CHEMICAL AGE.

SIR,—The action I have taken in order to test the legality of the various proclamations prohibiting imports has been widely misinterpreted. The political correspondent of one of the leading London dailies, for instance, wrote: "The judgment has given much delight to the Cobdenites, for the case was brought to the courts on political rather than on commercial grounds." I would like, if you will allow me, to put this right. I am not a politician, but a business man, and have never spoken on a political platform, and this is the first time in my life that I am addressing the editor of a paper. The case was brought purely on business grounds, and in consequence of my firm having suffered very severely from official interference. I have neither sought nor accepted any financial assistance, but, of course, if the Government carry the matter to appeal I may be compelled to do so.—Yours, &c.,

21, Farringdon Street, E.C.4. JOHN BROWN
December 23. (Brown & Forth).

## Chemists' Salaries

*To the Editor of* THE CHEMICAL AGE.

SIR,—It may interest some of your readers to know that the National Association of Industrial Chemists is the only registered trade union which cares for the interests of the whole of the analytical and consulting chemists in the British Empire. By its very position as a trade union it is specially well placed for doing all that is at present possible to raise the salaries of chemists.

Unlike some other associations it does not cater solely for the "affluent" men, but equally—and in some cases specially—for those whose opportunities for college training have been practically negligible. At the same time, its membership includes many men with good academical qualifications. This Association has been instrumental in obtaining increases of salaries in a considerable number of cases, and it played a very large part in fixing the minimum salary for chemists at one of the large Government departments. Consequently, it has a special claim on all who feel that their salaries are lower than should be the case and who are anxious to unite with others in improving their economic condition.

I shall be glad to send forms of application for membership to those who care to write for them.—Yours, &c.,

The White Building, Fitzalan Square, Sheffield.
December 30.

J. W. MERCHANT, Asst. Secretary.

*To the Editor of* THE CHEMICAL AGE

SIR,—Referring to your leading article on "Chemists' Salaries," in your issue of December 20, may I be permitted to call the attention of your correspondent to the British Association of Chemists, an organisation the chief aim of which is the raising of the status of chemists? The Association now has sections in most of the principal manufacturing centres where chemists are employed in considerable numbers, London, Manchester, Liverpool, Derby, Leeds, Bradford, Huddersfield, the North East Coast, &c., and already in not a few cases has successfully intervened where inadequate salaries have been offered to chemists. In order to carry out its work successfully the Association has found it necessary to become registered as a Trade Union.

Chemists will never improve their position by individually airing their grievances. They must act together. The enlightened employers of chemists in this country pay their chemists well. They, however, are in a minority. The majority must be enlightened. This can only be accomplished by all chemists banding themselves together in a strong professional organisation. They will then have power to insist on adequate remuneration for their services, on fair agreements and fair conditions of service. Only then will the best brains of the country be attracted to the profession, to the great benefit of the community, the nation, and the Empire.

Full particulars of, and forms of application for, membership of the British Association of Chemists can be obtained from the Hon. General Secretary, Bedford House, 8, York Place, London, W.1.—Yours, &c.,

7, Mauldeth Road West, Withington, Manchester,
December 23.

E. H. RODD, Hon. Editor, British Association of Chemists.

*To the Editor of* THE CHEMICAL AGE

SIR,—In your issue of December 6 (p. 660), your reviewer, O. L. B., I note, differs from what Mr. R. B. Pilcher says in his book, "The Profession of Chemistry," respecting the salaries of young chemists. O. L. B. says: "The average of the young chemist is now rather over than under £300 per annum." Let me tell O. L.B. that there are hundreds of chemists, old and young, who wish they could make him prove it. I will give you two cases, one "Old" and one "Young," of which I have first-hand information.

I have been head chemist for the larger half of a long life, at the largest works of its kind in the kingdom, where the foundation and successful running of the works and the business depends upon chemistry. I have been a young chemist and now I am no longer young, but have mines of experience. Yet I do not get the figure O. L. B. names. Why? Perhaps you may think (1) that I am all university varnish (2) a slacker, (3) a drinker, (4) short of imagination and initiative, (5) unprofitable. As to the first, I have done everything in a works from flue-cleaning to temporary manager, from office boy to pipe-fitters' labourer. Secondly, I can hardly be a slacker, as I have often worked 14 and 16 hours a day at the works and in my study at home. Thirdly, I am an abstainer. Fourthly, as imagination and ideals must come before initiative, I have taken out 13 patents (unlucky number). Fifthly, a man if unprofitable is not kept so long in one place cumbering the ground. Further, my processes both mechanical and chemical are in use all over the world, and one alone was sold for a sum well up in the five figures of pounds, and as a chemist's work is cumulative my worth must now be well into the five figures per annum. Then why am I paid so little? Simply this: Like many others I have been so engrossed and interested with my work that I had in my younger days forgotten to take my place in the queue for the flesh-pots. I always seemed to have something on hand, prospecting, thinking that the next stroke with the pick would turn out a nugget of pure gold and that I should get a share, which I didn't. I have occasionally answered one of those rare advertisements "Wanted, a Chemist &c.," and though I have only asked a very reasonable salary, the answers have been "We could not pay anything like such a salary"; "We could get a boat-load at 24s. a week"; "We should like to have you here, but our directors have an understanding with yours that we do not take each other's leading men." Let the B.A.C. note these replies.

Now for the Young Chemist—a smart youth who had worked in the offices, and in various departments of the works, and was also during the time attending science classes. Two years he was in the works laboratory; during which time he completed four years at a well-known technical school, passing successfully all his examinations. At this time his wages and war bonus were together 30s. per week. At the same time and at the same works young people of both sexes, doing simpler and much easier work for which they never spent a sou nor an hour's study, were being paid much more. Such is the penalty for entering "the profession of chemistry."

Let parents and their sons take my advice and not look on the profession of chemistry as a means to a livelihood, but look on it as a recreation. Chemistry is a beautiful game and the playing of it must be its own reward, just like playing cricket, billiards or golf.

Let us take a practical illustration. Take two youths of about equal calibre at the age of 14, both having passed the seventh standard. A, the artisan we apprentice to, say, a mechanic, joiner or plumber. C chooses Chemistry as a profession. At the age of 21 A has served his apprenticeship and now begins to get over £4 per week, and he has been getting a living wage whilst serving his apprenticeship; also, his wages will rise during the next few years. He is sure of work or some pay if out of work. He can attain to this without spending one hour in study or giving up one hour's leisure. However, he had paid to his trade union. Different is the case of C. If like A, he must earn wages during his probation and work all day in the works; he must go to school in the evenings and spend money for his education. He has no leisure, and whilst A may spend his leisure in summer on the green with bats and balls, and in the winter still on the green with billiard balls. C, without leisure, must burn the midnight oil at his studies. When he reaches the age of 21, he tries to get work where his studies will be of some use to him. If he is fortunate in getting a place it will be at a wage of about £100 a year, much less than a labourer of his own age. If he does not get work that he desires, which will probably be good for him, as with his training he may become labourer, foreman and manager, he will, perhaps, live to bless the day when he found the "profession of chemistry" was cold.

I quite agree with O. L. B. in his concluding remarks respecting educating the public to recognise the value of the chemist. I think this would be best done if shareholders instead of putting their money into businesses and then shutting their eyes were to take an interest in the businesses and demand a man on the directorate who would look after their interests, with instructions to see to it that scientific methods, at least, had a trial. The chemist to-day is cheap and common, and will remain so, until he does what other professions and tradesmen do—form a union, and then he may hope to be paid the princely sum O. L. B. speaks of.—Yours, &c.,

ALCHEMIST.

# The Manufacture of Intermediates

## Centralised or Decentralised Systems of Production

*In* THE CHEMICAL AGE *of December 13 we published the views, as put before us in an interview, of a representative of one of the foremost British dye-producing firms in connection with the manufacture of intermediates. The question at issue is whether, in the national interest, the production of intermediates should be carried out by the actual producers of tar or would better be left in the hands of separate concerns. We now publish two further opinions on the subject, the first by a tar distiller connected with one of the largest undertakings of the kind, and the second by a well-known gas engineer. As the controversy is of considerable interest, we shall be glad to have the views of other readers interested in the subject.*

### I.—By a Tar Distiller

LORD MOULTON, in 1914, urged the formation of a British dye industry, which must be too big to smash and too national to bribe. With such an opinion no farseeing economist would disagree, but an acute problem is presented when the means are considered for attaining such an end. Admittedly the production of intermediates is the key to the situation, and certain dye manufacturers maintain that they alone should deal with this branch of the industry. They have voiced their opinions in the Press and have spared no effort to educate an ignorant public to see their point of view in so far as they wish it to be seen.

There are very few problems, however, which are not two-faced, and it is highly questionable whether the obvious disadvantages to the nation of such a monopoly, hedged around as it would be by Government protection, tariff barriers and public apathy, do not outweigh the advantages which will accrue to the manufacturer and possibly to the dye consumer.

To endow a few people with a monopoly of a national necessity ensures that there will be no competition in the home market, and consequently the price of dyes for home consumption would be dictated by the monopolist concerned and might be out of all proportion to the manufacturing cost. The quality of the products might be inferior, and with no competition and a large demand, the dyemaker would become, in effect as regards quality and prices, judge, jury and prosecuting counsel in his own case.

#### German Organisation

Certain dye manufacturers refer frequently to the German organisation, the Interessen Gemeinschaft, but fail to observe that this body represents not one or two dye manufacturers, but involves the pooling of interests of manufacturers of heavy chemicals, intermediates, dyes and fine chemicals, and even suppliers of plant, without sinking the individuality of the various firms concerned. The high efficiency of production has not been produced by the efforts of a single factory or of a single research department, but has resulted, firstly, by keen competition between some half-dozen firms followed by the co-ordination of the best of their individual efforts and experiences extending over a period of 40 years with the evolution of sound composite processes. In this country all attempts to co-ordinate the efforts of the tar distillers and of the large gas companies with those of the large dye manufacturers have failed, and it cannot be granted that the large dye manufacturers have considered the position wholly from the national point of view, and with the elimination of the selfish attitude.

Great stress has been placed upon centralisation, but in continuation of this argument, and taking an obvious example, the advantages of the lower Thames Valley have not apparently received consideration as a natural seat of the industry. The London gas companies, carbonising annually between them over four million tons of coal, can produce sufficient crude coal tar products, with the possible exception of anthracene, to supply the total requirements of the dye industry in this country. One or more of these companies at present produce pure benzene, toluene, xylene, phenol, cresols, naphthalene, pyridine and high-grade anthracene, sulphuric acid, nitric acid, hydrochloric acid, ammonium salts, together with a number of intermediates, including the naphthols, naphthylamines and certain sulphonic acid derivatives of naphthalene. Surely the advantages of this supply of raw materials, not possessed by British Dyestuffs Corporation, merits a close consideration of the position of the large gas companies and tar distillers in the national scheme.

#### Dependence on Outside Producers

How far is British Dyestuffs Corporation independent in the supply of its raw materials? It draws all its raw tar products from tar distillers, coke oven or gas companies. It obtains its alkalies from the large alkali companies, and its ammonia from gas or coke oven companies through the ammonia distillers. Nitre for nitric acid is imported, and the nitre is converted to nitrite by outside manufacturers before it reaches the dye plant. The sulphur for its sulphuric acid is imported, and I believe it is even found cheaper to purchase oleum from a considerable distance than to manufacture it in Huddersfield. The tar distillers and gas and coke oven companies have, in many cases, concentrated in large quantities on one site as by-products, all these raw materials which British Dyestuffs Corporation purchase (often through dealers) and on which they pay packing and carriage. The sole exception to this is the alkalies, and even British Dyes have so far hesitated to take up the manufacture of these materials.

Coke breeze provides a relatively cheap fuel, and in London river frontage is available for the direct receipt of imported cargoes of nitrate, &c. Several tar distillers, and a few gas companies, have well equipped research laboratories with staffs of efficient chemists. The gas companies' staffs have a sound experience in the design of "complicated systems of cooling pipes, gas inlet and outlet pipes, and other devices," and the necessary supplies of skilled labour are available. The large gas companies would, therefore, avoid heavy freight charges on bulky raw materials and crude products, paying only for despatch of the much-reduced weight of the finished intermediate.

The use of intermediates without isolation is not of great general importance, as in many cases isolation is necessary to obtain the pure compound. The question of packing and transfer from one works to another carries relatively little weight, particularly as the manufacture of intermediates, and also their transference from one section of the dye manufacturing plant to another, do not lend themselves to the effective use of mechanical handling methods.

#### A Normal Gasworks Process

The large gas companies can tackle the problem on the desired scale, and can handle, as part of their normal work, the recovery of by-products such as weak ammonia liquors, spent acids, sulphur containing gases, waste solvents, &c. In this connection one wonders how many intermediates are required to the extent of 1,000 tons per annum?

The German dye mnaufacturers do not always use their own intermediates, but where advisable, obtain supplies from another more efficient plant, for instance, the Hoechst firm uses Badische hydrosulphite for making salvarsan. Many other examples might be quoted.

Dr. Levinstein has raised the point that dye works are potential arsenals. The Department of Explosives Supplies never kept its eggs all in one basket, and found an effective use for more than one small factory. From the point of view of dyes or explosives supplies it is clearly undesirable to locate the whole plant on one or two sites seeing that a disastrous fire, explosion, or strike might completely cut off all supplies. For certain intermediates, involving, for instance, obnoxious effluents, certain sites may offer peculiar advantages worthy of consideration for the production of one or two intermediates involving comparatively small scale operations. On these points the arguments of Lord Moulton, chairman of British Dyestuffs Corporation, effectively used in the House of Lords when opposing the monopoly involved in the Electricity Bill, apply equally well to the case under consideration.

#### Consumers Displeased

It is apparent from statements in the general and technical press, that consumers are not satisfied with the present lines of development of the dye industry in this country, and would welcome, to a certain extent, decentralisation and internal competition. The excellence and comparatively low price of certain intermediates already produced by firms outside the Dyestuffs Corporation are appreciated by the dye consumer.

It must not be understood that the writer suggests the indiscriminate production of intermediates by numerous small manufacturers, but one enters a plea for a working compromise in which the whole question is considered in detail from the national point of view. An unbiassed consideration of the subject will show that certain sections of the work can be effectively allotted to certain factories, one or two factories engaging in the manufacture of a given product. The energy of the whole organic and heavy chemical industries could thus be utilised for the fight, and while this army corps would show a united front to the alien enemy, a useful inter-unit rivalry leading to increased efficiency would be maintained at home.

## II.—By a Gas Engineer

The statement in connection with the manufacture of the finer coal-tar products which appeared in THE CHEMICAL AGE of December 13 is one which will be of particular interest to gas and coke oven engineers, for such engineers must realise that their process provides the first link of the long and complicated chain which forms the bond between our most important natural gift—coal, and the immense variety of fine chemicals which are derived from it. In pre-war days the average carbonising engineer knew little of even the elementary products obtained from the distillation of tar, and to talk to him of intermediates would merely be to take him beyond his depth; for it must be confessed that, whereas he could appreciate that dyes and drugs emanated from one of his main by-products, he had little notion of the existence of such necessary stepping-stones as the half-way products. To-day the position is certainly different, for the prominence given to all types of coal-tar products by the war, and the amount of literature which has been published on the subject, both in the technical and in the daily press, has been the means of educating the coal carboniser up to his responsibilities, and has prompted him to question himself as to whether in the national interest he is doing the best by his products, be the immediate outlook financially encouraging or not.

### Total Tar Output

The main question which arises is whether, so far as providing the country with the whole of the intermediates now required is concerned, it would be expedient for the several separate carbonising undertakings to carry on the processes themselves, in preference to the alternative policy of pooling? If the situation is analysed it may be seen that, apart from coke oven and some minor producers, the gasworks in the United Kingdom have a combined output of tar ranging round 200 million gallons per annum. This output, however, is derived from the united efforts of some 1,600 separate undertakings ranging in volume of tar production from 250 gallons to 27 million gallons per year. Obviously, therefore, it is useless to suppose that every gasworks can become a producer of intermediates, for no such works having a tar output of less than three million gallons would find it profitable to carry out even the preliminary process of complete primary distillation. It has to be borne in mind, moreover, that the working up of tar into pure products involves the use of substances, such as sulphuric acid and alkalies, which are not (at any rate so far as the latter are concerned) obtained on the spot, and this introduces the question of the expense of obtaining auxiliary materials from external, and usually expensive, sources.

At the present time the number of gas undertakings in this country which distil their own tar may be counted on the fingers of both hands, and so far as "intermediate" manufacture is concerned there are only two companies which have progressed thus far. It is difficult even to obtain from these two bold spirits any definite figures as to the financial aspects of the proposition, but obviously if they can do little more than make both ends meet the prospects for others would not be very bright, as the two undertakings in question are the largest of their kind in the country. One of these, the South Metropolitan Gas Company, is a comparative newcomer amongst "intermediate" manufacturers, and although this undertaking has already a reputation for the quality of its products, it is believed that a large part of the works which were erected during the war for explosive purposes is now shut down. This, perhaps, is a little difficult to understand, for it may be supposed that the plant might be adapted for the production of parent substances employed in the manufacture of synthetic dyes and drugs.

### Unappreciated Chemists

Although the question of "gasworks as intermediate producers" is one which is now of general interest, it may be confidently stated (although the opinion is merely that of a hardened and, perhaps, unscientific gas engineer) that except in most exceptional instances the scheme is impracticable. In the first place, the majority of gas engineers have quite a doubtful opinion of the value of the ordinary routine tester; they have, unfortunately, no respect whatever for the research chemist, and to be surrounded by a platoon of highly-trained specialist-chemists would bring them to an early grave. There is, perhaps, some hope that, say, a dozen of the larger gas undertakings might take the matter up, but the problem is one which essentially demands concentration and centralisation. The avoidance of anything in the way of duplication of effort would have to be ensured if the process was to be really profitable, and the only way of dealing with the matter would appear to be for the interested concerns to set up a central body to whom all problems could be submitted. Each undertaking could then deal with its own product, but from the technical point of view all would be working on the same lines, and would be guided by their central directorate. The same body might also control the sale of the products produced, and in doing so it would probably have to follow the usual tactics associated with "rings." However, it is an easy matter to make mere paper suggestions, which would in all probability be faced with some unrecognised and remarkably stubborn facts when it came to an actual start. One is tempted to wonder, for instance, what would be the attitude of the large number of chemical undertakings at present carrying on the business—undertakings which, apart from the British Dyestuffs Corporation, have an aggregate capital of some £25,000,000.

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Mr. E. V. Evans, the chief chemist of the South Metropolitan Gas Company, in answer to our request for his views, writes that his opinions have not materially altered from those expressed in his Paper read last July at the annual meeting of the Society of Chemical Industry. He states, however, that he is dealing with the problem again in an address to be given before the London Section of the same Society on Monday next, January 5. A report of this address will be given next week.

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### A Famous Whitefriars Glassworks

POWELL'S GLASSWORKS, situated at the corner of Tudor Street and Whitefriars Street, and dating back to the 17th century, are shortly to be removed to Harrow, and, according to a statement by Lord Northcliffe, a new Carmelite House is to be built on the site. The glassworks were founded by William Davis in 1680, and many famous artists have been associated with them. In 1834, they passed into the possession of the Powell family, and Mr. A. C. Powell, the surviving head of the family, has been associated with the works for 53 years. When the war broke out it was thought that the finer kinds of glasswork which the firm produced would not be in much request. The Powells, however, quickly found their experience in demand by the Admiralty for the manufacture of glass tubes for mine-horns. These and other requirements were new to them, but in some 48 hours they were able to produce a glass which met the necessities of the time. This glass was described by the Department of Science and Technology as having a "higher resistance to changes of temperature than any glass previously known."

So great was the demand made on the firm as a controlled establishment under the Ministry of Munitions, and so large the variety of glass called for, that the Ministry urged Messrs. Powell to provide more commodious works. Land had been taken at Harrow for this purpose when the armistice came. The new factory will be accompanied by new features in which the members of the firm are taking a keen interest as experiments in improving the relations between employers and employed. On the formation of the company, Mr. Harry Powell retires after nearly 50 years at Whitefriars, and Mr. J. H. Gardiner who, for 30 years, was personal assistant to the late Sir William Crookes, joins the company. Steps are being taken to acquire the apparatus used in Sir William Crookes's laboratory for determining the physical properties of the glasses known under his name, some of which it is proposed to manufacture in the near future. The company hope to continue the pre-war artistic occupations of the old firm, and, in addition, to meet the country's demand for scientific glass, which has been classed as one of our unstable key industries.

# English Oilfields, Ltd.

## Chemical Adviser's Statement on Processes and By-Products

At the annual meeting of English Oilfields, Ltd., on Tuesday, in London, presided over by Sir James Heath, exhaustive statements were made by Dr. W. Forbes-Leslie and others respecting the company's operations and prospects. Among the speakers was Dr. Edward Burnet, consulting chemical adviser to the company, who described the chemical constituents of the various products found in the properties.

Petroleum bodies, he said, are extremely complex mixtures of hydrocarbon compounds, often containing many widely varying substances, although in small amounts—sulphur compounds, oxidation products, nitrogenous substances, &c., whose exact nature is not always clearly defined. The complexity of these combinations is admittedly great in all of the well-known types upon which very considerable researches have been made, and is even more so in the Norfolk series, which present features never met with hitherto anywhere else. Therefore, at present we are to some extent, chemically speaking, in a *terra incognita*, and can only dimly estimate the true intrinsic value of what we have in sight. It may be that the final results of investigations now in progress will far exceed the most sanguine expectations of all of us, who are already more than justified in emphasising the mineral wealth of the Norfolk seams.

### Need of Research

The necessity for continuous research is fully realised by the directors, and requires to be thoroughly appreciated by the general body of the shareholders. The use of natural laws offers a more stable basis upon which to erect a great national industry, such as you have inaugurated, than any structure built upon artificial conditions created by pure empiricism. Moreover, the quality and value of a product are based upon the application of correct principles in its conception, preparation and use, and these principles can only result from scientific research. Chemistry is truly the intelligence department of the petroleum industry, as of many others, and its activity is particularly called for in the solution of the special problems associated with the Norfolk shales. Some of these have already been solved, but others remain to stimulate the skill and ingenuity of your scientific staff. It is true that free oil exists as such in the shale, but the bulk of that which is obtained is produced by the destructive distillation of the complex organic compounds of which the latter is largely composed. On the application of heat, in the absence of air, these organic matters are decomposed the gaseous constituents driven off, consisting mainly of water vapour, hydrocarbon oils, and permanent gases. The shale is therefore heated in a retort,a vertical one down which the material is fed by gravity being almost universally used. The gaseous products of distillation are removed under slight suction, aided by the introduction of steam, which not only helps to sweep the oil vapours out of the retort, but also serves to distribute the heat more evenly throughout the mass, to form water-gas from the fixed carbon in the shale, and ammonia from the nitrogenous compounds present. The gaseous elements thus given off are now cooled in suitable condensers, when it is found that a proportion assume a liquid form, whilst the remainder are not condensible. The condensate consists of oil and water, and is run into receptacles, where they are separated. The water is found to be strongly impregnated with ammonia, which is recovered as ammonium sulphate on treatment with sulphuric acid. The non-condensible portion, or permanent gas is passed through scrubbers to remove every trace of light oils and ammonia, and is then used as fuel for heating the retorts. After being separated from the ammonia water the crude shale oil is transferred to stills, where it is separated into various factions, each with its specific boiling point, by distillation. The scrubber oils are also distilled, and any light oils recovered from them are added to the corresponding products from the distillation of the crude oil.

### Percentage of Volatiles

The percentage of volatiles in a sample of shale affords a rough idea of the number of gallons of oil per ton that can be reasonably expected, and is a factor of considerable importance in estimating the probable value of the shale as a source of oil. But all the volatiles are not condensible, and the greater amount of permanent gas produced the less the amount of oil. The type of the retort, the manner of heating, and the readiness with which the gaseous products are removed out of harm's way, are indissolubly associated in determining the relative proportions of condensible and permanent gas produced. The Norfolk shales are indubitably very rich in volatiles—much more so than the Scottish, on account of the fact that the proportion of organic matter in the former is considerably greater than that in the latter. Many of the Norfolk seams give from 60 per cent. to 70 per cent. of volatile matter, representing a possible output of oil of at least from 80 to 100 gallons per ton; whilst a volatile percentage of over 40 is common. The average amount of oil produced from the Scottish shales is 23 gallons per ton. With suitable retorting 60 gallons per ton of Norfolk shale is not an extravagent estimate. Some seams can certainly do much better, but the choice of working is naturally governed by the environment and it is not always politic to work the richest strata first. As a rule the yield of ammonia from the Scottish shale varies inversely with that of the oil, those which are rich in the latter being poor in the former. This does not hold good in Norfolk, on account of the higher nitrogenous constituent. The difference in probable origin of the two types of shale has already been explained on geological lines by Dr. Forbes Leslie, and the chemical evidence would certainly seem to substantiate his contention. From 60 to 70 pounds of ammonium sulphate per ton have been recovered from your shale; but the amount naturally varies with the general characters of the individual seam. The spent shale from the retort is usually regarded as a necessary nuisance, but we have hopes of turning even this to advantage. Sir George Scott Moncrieff reminds me that the twentieth century is the concrete age, and owing to a capital supply of suitable chalk and clay on your properties a considerable revenue may be anticipated from the manufacture of cement, in which the spent shale would be utilised. I received this morning the official result of a test made on the Portland cement produced from the spent shale of the retort. The breaking strain in pounds from one square inch of section was 523⅛—the standard is only 450—thus showing over standard cement an increase of 16 per cent. when using the neat material. Let us take Portland cement which is mixed, three parts of sand with one of cement; the breaking strain was found to be 373⅛ lb. to the square inch, whereas the standard is only 200 lb., showing an increase of 86 per cent. above the normal standard.

### Refining Processes

The crude oil of Norfolk is of a reddish-brown colour, with a "healthy" aromatic odour, somewhat suggestive of a whiff of garlic. At ordinary room temperature it is limpid in consistency, and has a specific gravity approaching that of water (0·998). On fractional distillation it yields, under suitable conditions, from 10 per cent. to 20 per cent. of gasolene, and from 50 per cent. to 40 per cent. of kerosone. (Hear, hear.) The residue above 270 deg. C. is about 40 per cent. The residue is usually liquid at room temperature, but after distillation up to 300 deg. C. a bituminous residue is left, which has a specific gravity of 1·170 and a melting point of 82 deg. C. Of this, nearly 90 per cent. is soluble in carbon disulphide, and the value of this material as a binder in road-making, particularly where motor traffic is great, can scarcely be exaggerated. The various fractions obtained by redistilling the crude oil have now to be refined. Time and experience alone will enable us to determine definitely the exact cost of producing the finished product. Shale oils differ from crude petroleum in containing certain organic compounds characterised by an odour which is not calculated to enhance their value; moreover, they are more highly unsaturated than petroleum. The unsaturated groups are removed in the process of refining, by means of treatment alternately with acids and alkalies, and their elimination means a considerable amount of loss. The average refining loss for Scottish shale oil is about 25 per cent., and that of Norfolk oil is much about the same, or possibly a little more. Now, instead of removing the unsaturated compounds, the ideal method of treatment would be to induce these to take up more hydrogen, and bring them to the hydrogen standard of the more valuable constituents. Several methods of effecting this have been accomplished, but the time is not yet ripe for putting these into practice on a large commercial scale. The depolymerisation of heavy oils, reconstituting them into motor spirit of great commercial value has also been accomplished with much success, so much so, indeed, that we can undertake the conversion to advantage. These subjects are of great practical interest, and will well repay for the time and trouble spent upon them in the research department.

### Marketable Products

The marketable products obtained by refining the crude oil are motor spirit, illuminating oils, gas and fuel oils, lubricating oils, paraffin wax and the bituminous residue previously described. The commercial applications of these are well known, and require no description. Sulphate of ammonia is in constant demand for fertilising purposes, and if sugar-beet growing is established to any great extent in this country, the present high price of this commodity will probably soar higher still. The making of bricks and tiles, the manufacture of cement and the provision of bitumen for road-making are all likely to be called upon in the national reorganisation necessary to solve the great problems of reconstruction. Amongst the unconsidered substances which have been prepared from the less valuable by-products of the oil is a rubber substitute and an insulating material for electrical purposes, both of which have a great future before them. Then we have disinfectants, preservatives for canvas, wood, stone, and metal, and even dyes. These and many others will eventually be drawn into the net, to swell the resources of your enterprise. I would, moreover, draw your attention to the fact that medical science will be glad to avail herself of what we can produce. Just as the coal-tar pro-

ducts are the very backbone of synthetic drugs—the benzene radical forming the basis of some of the most valuable of these—so do the aromatic principles of the Norfolk oil supply a pabulum for the preparation of therapeutical articles of considerable commercial value. We can supply that ancient remedy known as "Dutch drops," or a commodity equal to it, to the tune of 20 gallons to the ton of shale, and as this retails at the fancy price of £50 per gallon or thereabouts, anything like a brisk demand should be the death-blow to the gloomiest pessimist. We have prepared an ichthyol from the heavier distillates, which answers all the tests of the British Pharmacopœia; and at the present time this material is almost priceless. A simple ointment containing 10 per cent. of one of the fractions of the Norfolk oil, has been largely tried in the treatment of certain parasitic diseases of the skin with remarkably good results. And lastly, inhalation of the garlickly vapours of the crude distillate has produced marked amelioration of the symptoms in tuberculous and other affections of the lungs. The medical aspect is one which I do not wish to emphasise unduly, but it possesses great possibilities nevertheless. I know of no other shale oil equal to the Norfolk for therapeutic purposes.

On the oil issue alone it must be acknowledged that success is assured, and when we take into account the numerous other side-lines referred to and the prospects afforded by the utilisation of waste gases not required for our own domestic purposes, the establishment of kindred industries where heat and power are requisite, the condensation products obtained by burning the spare gases, the manufacture of bricks, drain pipes, and tiles, and the making of cement, breeze-concrete, and allied materials, there can be no possible hesitation as to the future prospects of the undertaking.

# Chemistry and Industry

## Address by Professor Findlay at Aberdeen

DR. FINDLAY, professor of chemistry in the University of Aberdeen, delivered a lecture on "Chemistry in Relation to Industry and Commerce" at the Chamber of Commerce Rooms on December 22. Mr. G. Davidson, manager of the Great North of Scotland Railway, presided over a large attendance.

### Apathy of Mnnufacturers

Professor Findlay said that for half a century and more men of science, and more particularly chemists, had sought to arouse in manufacturers a greater interest in and appreciation of the value of the study of chemistry and the application of chemical discoveries to industries. Chemists had got very impatient with what they regarded as the ignorance and apathy of manufacturers, but, while it was easy to place on the latter the responsibility for the general backwardness of this country in applying the discoveries of chemical science to industry, the chemists, the teachers, and the leaders in chemical science were themselves not wholly free from blame for failing to enter more fully into the difficulties of the manufacturers, and for their failure to keep in touch with industrial life, and to show more clearly and convincingly the relation between their own work and pure science and the practical everyday life of the community. There had been a lack of mutual trust and comprehension, which proved a misfortune for the whole country. This country had never greatly valued her chemists or sought adequately to encourage them in their work or to apply the results of their discoveries to industry. Owing to a natural inertia of mind, and a fairly widespread prosperity, the necessity of promoting chemical science for the purposes of diminishing waste and improving production, and for the establishment of new industries, had never really entered into the tissue of people's minds.

### Association of Pure and Applied Chemistry

At the present day people often spoke of pure chemistry and applied chemistry as if they were distinct things, and the practical man, not specially trained in science, was inclined to despise pure chemistry and to insist that what was wanted was applied chemistry. Such an attitude of mind was fraught with the greatest danger. All advance was dependent on the growth of pure science and of knowledge pursued without consideration of its immediate utilitarian value. If our industries were to be built on a sure foundation their proprietors must be convinced that pure scientific research work, carried out in the laboratory, was the soul of industrial prosperity. It was necessary, too, that adequate encouragement and honour should be given to those who devoted their lives to the advance of this knowledge, that the institutions where such work was fostered were sufficiently endowed, and that rewards were made sufficient to attract to the work a large number of their ablest young men, whose ambitions led them, at present, to the higher branches of the medical and legal professions.

### Works Chemists

There were three types of chemists necessary to industry, the research chemist, the process chemist, and the analytical chemist. Every industry should possess a competent analyst at least, but in a works of any size the process chemist was not less essential. There was one department in every works of which a qualified chemist should be placed in charge—the fuel consuming and power raising plant. Coal was purchased in a most unscientific way in industries of the present day. Manufacturers should burn coal for the production of heat and not concern themselves so much with the weight of the fuel as with the amount of heat which a given weight of coal could give out. It was most unscientific and unbusinesslike to purchase coal merely by weight without regard to its calorific value, and although the latter system had been common practice for some time in Germany and in the United States, the London County Council was the only public corporation in this country which had insisted on the proper method being followed out. The research chemistry department was the brain of industry, and in order that its work might be successfully carried out it required an efficient intelligence department, an efficient library, and a factory staff capable of understanding the work which was being done. To establish such a department required faith both in science and in money, and, although faith in science had never been very strong in this country, it had never failed to obtain its reward.

The University teacher should make himself acquainted with those who were engaged in the industries of the country, and it was most important that the professors who were training the future industrialists and industrial chemists should understand something of the problems with which the manufacturers were faced, and should know their wants and needs. While at Aberystwyth University College he initiated a scheme of co-operative research with the local manufacturers. It worked very successfully, and a similar scheme, he hoped, might be developed in Aberdeen. It was important that they should know each other's work better; that they should get to know each other's problems and difficulties better; that a greater faith in chemists should be acquired, and that reasonable rewards should be offered for their services.

### Discussion

In the course of discussion Mr. G. HUTCHESON expressed a hope that Dr. Findlay would be able to turn out a generation of practical chemists for various industries. In the past they had been accustomed to think of professors as far beyond their reach and as quite out of touch with mere business problems. He welcomed the idea of fuller co-operation.

Mr. A. T. M'ROBERT said the Highland Agricultural Society had a chemist whose duty it was to make an analysis of the soil in unproductive areas, and to suggest suitable fertilisers, but the difficulty had been in the past that the farmer had not sufficient scientific knowledge to take advantage of the chemists' reports. Aberdeenshire was the first district where the farmers themselves had formed analytical societies, and engaged analytical chemists, and the first district where manufacturers of foodstuffs and fertilisers had given guaranteed analyses. He had tried to introduce the selling of coal on the basis of calorific value, but had found that the great difficulty was that this value could not be guaranteed because the seams were not classified; they were mixed. To make the system a success something would have to be done to classify the value of the coal at the colliery and to ensure that on the way to the consumer moisture should not reach it.

Mr. ROBERT MILNE referred to the poor quality of English dyes, and asked whether the intellect of the British chemist was equal to the intellect of the German chemist, and whether it was possible for us to recapture the trade in dyes and produce an article equal to the German.

### Dr. Findlay's Reply

Professor FINDLAY explained that University professors were appointed on the understanding that they had to devote their whole time to the work, and accordingly they could not go into research work privately on behalf of manufacturers. He urged that each large firm should have its own research chemist. The Universities would turn out such specialists if the firms would promise to employ them. Up to the present there had been no prospect for students from that quarter.

As to Mr. Milne's question, British intellect in regard to the work of chemists was certainly equal to German. This was evidenced in the production of poison gas during the war. Germany, however, before the war, had 300 chemists to our six, and that accounted for their advances in science. The British dye industry was conducted by industrial men without the co-operation of specialist chemists, and in that lay their failure to compete with the Germans. The attitude adopted by British firms was that they would not appoint chemists on their boards of directors because, having special knowledge, they might get a hold over the others. There was nothing to prevent the British producing dyes as good as the Germans if they appointed chemists on their staffs, but it would take a few years to make up the forty years of leeway the Germans had, and to compete at similar rates. The training of chemists would take up time, and so would the research work they would have to undertake.

MESSRS. BUSH, BEACH & GENT, INC., of New York, dealers in chemicals and dyes, announce that they have removed their London office from 57, Gracechurch Street, E.C.3, to larger premises at 10 Union Court, Old Broad Street, E.C.2.

# Future Supplies of Motor Fuels

## Paper by Mr. Harold Moore, M.Sc.Tech., F.C.S.

MR. H. N. MORRIS presided at a meeting of members of the Chemical Section of the Manchester Literary and Philosophical Society on December 18, when a Paper on "Future Supplies of Motor Fuel" was read by Mr. Harold Moore.

Prior, Mr. Moore said, to the advent of the internal combustion engine burning liquid fuels the lighter petroleum products were almost waste products, and were utilised for heating stills, boilers, &c., and in some cases were allowed to evaporate away. The actual separation of the volatile products was necessary on account of the flash-point regulations dealing with the storage and transport of the heavier petroleum products. The demand for petrol for automobile engines was, therefore, readily satisfied in the early days of the petrol engine, though it was necessary to subject the volatile products to the acid and alkali washes known as the refining process. The specific gravity of motor spirit in 1905 was about 0·690 at 15°C., and it was a highly volatile product. At the present day some grades of "spirit" had specific gravities as high as 0·760.

### Developments to Meet Increased Demand

The import of petrol into this country, in 1905, was 18 million gallons, and in 1914, 120 million gallons. This great increase in demand had been met in the first place by an extension of the limits of the "cut" for the petrol fractions to include higher boiling fractions. This produced heavier spirit, and as the engines of that day were only capable of utilising highly volatile fractions, the demand would have exceeded the supply if the invention of the jet had not saved the situation by permitting the use of heavier spirit and of spirit collected over wider ranges of temperature.

Following this development the temperature ranges of the "cut" in the distillation were increased to include both heavier and lighter products, and of recent years the heavier constituents of natural gas had been condensed by pressure and cooling and used as a "livening" agent. These developments would have been insufficient to cope with the increasing demand for spirit had it not been for the introduction of cracking on a large scale. Cracking consisted of subjecting heavy petroleum oils (usually of higher boiling point than kerozene) to heat and pressure, whereby compounds of lower molecular weight, and therefore lower boiling point, were produced.

Cracked spirit was of higher gravity than "straight" distilled spirit of the same boiling point. It was slightly disagreeable as regards smell, but otherwise was a good fuel. Practically all of the cracked spirit produced in the United States was taken up by the home market, the straight distilled spirit being exported. The process increased the possible yield of spirit from an average of 5 to 10 per cent. on the crude oil to 50 to 80 per cent. of the crude oil. This altered the entire aspect of the motor spirit problem.

### No Shortage Anticipated

At present there was little fear of a motor spirit shortage, unless there was a shortage of all petroleum products. The question resolved itself into one of which product could stand the highest price. Probably lubricating oils and medicinal products could command the highest prices. After these came motor spirit, then illuminating oils, then heavy oils for engines, and lastly furnace oils. The supply of furnace oils would, therefore, suffer most by the introduction of cracking.

The majority of people engaged in the petroleum industry did not expect any petrol shortage, at any rate for several years to come, in spite of the rapidly increasing demand. The shale oil supply was less than ½ per cent. of the world's petroleum supply. Benzol was at present the main petrol substitute, the principal sources for it being coal tar and coke oven gas. Gray and Mellanby estimated the possible yield in the United Kingdom, if all benzol were recovered from these sources, as follows: From coal tar, 2 million gallons per annum, and from coke oven gas, 26 million gallons.

### Benzol

It did not appear probable that there would be an enormous increase in coal production in the near future, and therefore benzol was not likely to satisfy any large portion of the demand for motor spirit. The actual production of benzol at the present time was about 10 per cent. of the quantity of petrol imported, and a large part of the supply was taken up by industries which were in a position to afford higher prices than appealed to motorists. At the best benzol would only make a slight addition to the motor fuel supply, and its best method of utilisation would probably be in the form of mixtures.

### Alcohol as a Substitute

The most promising source of petrol substitute at the present moment appeared to be alcohol. Though alcohol was low in heat value, viz., 12,697 B.Th.U. gross, it had the advantage of only requiring a small amount of air for combustion, and possessed a high ignition point, and was therefore able to withstand high compression pressures in internal combustion engines. Given a suitably designed engine it yielded about the same power per gallon as petrol. The possibilities of fuel alcohol in this country were not very promising. Mr. Moore stated that Dr. Ormandy, who had specialised this subject for many years, had informed him that he considered the most suitable method of preparation to be by the alcoholic fermentation of vegetable matter, and that the necessary vegetable substances could be most economically grown in tropical or subtropical countries. The calcium carbide process could not, under existing conditions, compete with the fermentation process as regards cost of production.

One point to which Mr. Moore desired to call attention concerned the methods used in valuing motor spirits. Hitherto motor spirit analysis had consisted of routine laboratory tests. These were, however, quite inadequate for the object in view and special tests were really required. Though for ordinary commercial purposes the distillation test was sufficiently accurate, it was really only being used as a measure of the volatility, which was correctly measured by the vapour tension. Also in the past little notice had been taken of the importance of the ignition point, which was an indication of the maximum engine compression permissible, of which the thermal efficiency was a direct function.

### Mixed Fuels

The use of mixed fuels was yet in its infancy, but if maximum economy was to be obtained it would be necessary to employ a standard mixture as motor spirit for general use and to adjust the engine compressions to the corresponding permissible value. At present about 25 per cent. of the power available in benzol was wasted by the use of the fuel in engines which were primarily designed for petrol. A further advantage of the employment of mixtures was that usually two chemically different bodies of approximately the same vapour tension yielded mixtures the vapour tensions of which were higher than those of either constituent. The use of mixtures had already been adopted by the air forces, namely, 20 per cent. benzol and 80 per cent. petrol mixture, with the result that there were several advantages over normal petrol.

# Manchester Dyers and Colourists

## "The Tinctorial Properties of Anthocyanins"

A SUBJECT which has interested research workers practically since the time of the learned physician and botanist Nehemiah Grew (1641-1712) was dealt with by Dr. A. E. Everest in a Paper read before the Manchester Section of the Society of Dyers and Colourists, on Friday, December 19. Mr. J. R. Hannay presided.

DR. EVEREST said a great deal had been heard of late about the dyeing properties of fruits, such as blackberries and damsons, and it had been suggested that onion skins were capable of being used for tinctorial purposes. Such colours could not be described as marketable products, and the dyeing trade must pursue its investigations not back to nature, but forward from it in the direction of synthetic dyes. It was, however, probable that anthocyanin pigments had been used for "staining" textile materials from quite early times, and the pigment of the black hollyhock was once used for dyeing purposes in Bavaria to such an extent that the Bavarian Government actually subsidised research investigations into the colouring possibilities of that flower.

The main purpose of the Paper was to deal with the actual dyeing properties of the red, purple and blue colouring matters which were known as anthocyanins. These natural colours had considerable affinity for tannin-mordanted cotton and produced excellent shades upon that material. On the other hand, the shades, although fast to light, were not fast to washing or hot water, and were, therefore, of little practical value. With regard to mordanted wool, the glucosides, or the colours as they occurred in the plants, had but little affinity for tinned and similarly mordanted wool; but if the glucose residues were split off by hydrolysis, then pigments were produced termed anthocyanidins, exhibiting very considerable affinity for mordanted wool, and producing clear, strong shades on the materials. Although blackberries and bilberries could, therefore, produce soft beautiful shades, and in emergency might be used to such purpose, those shades were not of sufficient fastness to permit of their competition with synthetic products. There was some possibility that future research in this group might yield products of great beauty with the requisite fastness, but up to the present this end had not been achieved.

# Catalogues Received

THE BARNET X-RAY PLATE.—This plate has been specially prepared for radiographic purposes and combines with maximum speed the necessary latitude and density-giving power. It is coated with an emulsion rich in silver salt and used with a Coolidge tube gives valuable results in radiography and in connection with X-ray therapy, particularly for malignant diseases. The catalogue is well illustrated and contains useful hints for the application, development and manipulation of the plate.—Elliott & Sons, Ltd., Barnet. Pp. 20.

WAGONS.—A useful short list giving concise particulars of some thirty selected types of wagons, skips, platforms, bogies, turn-tables, &c. The wagons can be fitted with roller, ball, cast-iron, cast-steel, or bushed bearings with self-oiling axles or grease sleeves as required.—McLachlan & Co., Ltd., Darlington. Pp. 29.

## Scottish Shale Oil Industry

An interesting review of the shale oil position in Scotland is published in the annual Trade Supplement to the *Glasgow Herald*. A great change has come over the fortunes of the Scottish shale oil companies, it is stated, since the various reports were issued in the spring, and the usual meetings of shareholders took place. At every meeting very gloomy forecasts of the possibilities of the future of the industry were uttered, and a severe drop took place in all the shares. The results of the year's working were disclosed as follow :—

| Capital | Broxburn. | Oakbank. | Pumpherston. | Young's. |
|---|---|---|---|---|
| Debentures ... | — | — | — | *£300,000 |
| Preference ... | £100,000 | £100,000 | £150,000 | — |
| Ordinary (paid up) | 199,750 | 170,000 | 285,500 | 452,808 |
| Profit ... ... | 73,167 | 56,380 | 190,815 | 107,895 |
| Brought in ... | 14,283 | 25,288 | 30,508 | 10,553 |
| Ordinary dividend | 15% free of tax. | 15% free of tax. | 40% subject income tax. | 6% subject income tax. |

* Includes £150,000 B debentures with contingent rights.

Negotiations were entered into by the Anglo-Persian Oil Co., as a result of which Scottish Oils, Ltd., was formed for the purpose of consolidating the interests of the existing Scottish shale oil companies with the object of effecting economies and of further strengthening their position by securing the supply of imported crude oil necessary to run the existing refineries to their full capacity. At the statutory meeting of Scottish Oils, Ltd., held in London on Tuesday, Sir Charles Greenway stated that 99 per cent. of the ordinary shareholders of the Scottish companies accepted the offer of the Anglo-Persian Oil Co. to purchase their shares, and the Seven per cent. (non-cumulative) Participating Preference shares of £1 each (fully paid), agreed to be given in satisfaction of the purchase price, have been allotted, and the share certificates will be issued in a few days. The arrangement for the joint sale and distribution of the products of the Scottish oil companies, and also of the imported products formerly sold in Scotland through the organisations of the British Petroleum Co. and of the Homelight Oil Co., have been completed, this business now being handled entirely by one organisation, the Scottish Oil Agency, Ltd., which is the selling branch of Scottish Oils, Ltd., and of its subsidiaries.

## New Year Honours

The list of New Year Honours published on Thursday contains the names of the following :—

K.C.B.

Sir Richard Tetley Glazebrook, C.B., F.R.S., late Director of the National Physical Laboratory.

BARONETS.

John Traill Cargill, Chairman of the Burmah Oil Company. For Public Services.

Sir Arthur Trevor Dawson, M.I.C.E., M.I.M.E., R.N., Knight Grand Cross of the Order for Naval Merit of Spain ; Order of the Rising Sun of Japan ; associated with the firm of Vickers, Ltd. For public services in connection with the Home Office, War Office and Admiralty work.

Edward Mackay Edgar. Head of the firm of Sperling & Co., merchant bankers, Moorgate Street. For public services, particularly in connection with British and Canadian trade.

KNIGHTS.

Col. William Alfred Churchman, Chairman of the Petrol Committee. For public services in connection with the Ministry of Munitions. Explosives Department.

Halford John Mackinder, M.P., Chairman of Electro Bleach & By-Products, Ltd. Public and Parliamentary services.

Francis Grant Ogilvie, C.B. Assistant Controller in Trench Warfare Research Department, Chemical Warfare Department.

Professor Arthur Schuster, F.R.S. Late Secretary of the Royal Society.

Lieut.-Col. William Abraham Wayland, J.P., Chemical Manufacturer. Mayor of Deptford, 1914-19. For public and local services.

## Contracts Open

Asphalte.—For Durban Municipal Council. Particulars from Borough Engineer, Municipal Buildings, Durban. Tenders by January 28.

(3) Portland Cement ; (9) Disinfectants. Particulars from E. J. Lovegrove, Town Hall, Southwood Lane, Highgate, N.6. Tenders by January 5.

(3) Section A, paints ; Section B, varnishes ; (7) petroleum oil ; (14) carbolic powder ; (15) Portland cement ; (16) Section A, lubricating oils ; Section B, fuel oil. (17) Tar and pitch, includes refined tar for use in the construction of tarred macadam roads and for tar spraying. (19) Explosives ; (22) soap yellow, carbolic, toilet and soft) ; (24) Creosote ; (28) Disinfectant Fluid ; (30) Linseed oil, turpentine and turpentine substitute. For Plymouth Corporation. Particulars from T. Pierson Frank, Borough Engineer and Surveyor, Municipal Offices, Plymouth. Tenders by January 17.

## Patents, Designs and Trade Marks

Attention is drawn to the provisions of the Patents and Designs Act, 1919, and the Trade Marks Act, 1919, which received the Royal Assent on December 23, 1919. These Acts amend the Law of Patents, Designs and Trade Marks in many important respects.

### Patents and Designs Act

With certain exceptions, the Patents and Designs Act, 1919, will come into operation upon the date of the passing of the Act, and the following provisions which, amongst others come into force *immediately*, should be noted :—

*Section 6.—Term of Patent.*—The term of all patents in force at the date of the passing of the Act, and of all patents granted after that date, is extended from 14 years to 16 years, subject to certain safeguards in the case of existing patents. The fees to be paid in respect of this extension of term will be prescribed and announced in due course.

*Section 4.—Opposition to Grant of Patent.*—The ground of opposition to the grant of a patent prescribed by Section 11 (b) of the Act of 1907 has been extended to include prior publication in the United Kingdom (with certain limitations as regards prior publication in British specifications), and an additional ground of opposition to applications for patents under Section 91 of the Act of 1907 is provided.

*Section 16.—Registration of Assignments, &c., of Patents and Designs.*—Amends Section 71 of the Act of 1907, and provides that all assignments, &c., must now be registered.

*Section 18.—Registration of Patent Agents.*—This section provides for the compulsory registration of all persons practising or describing themselves as patent agents.

*Schedule.—Amendment of Section* 1 *of the Act of* 1907.—The time for leaving a complete specification on an application originally accompanied by a provisional specification is extended from six months to nine months.

The times for acceptance of a complete specification and sealing of a patent are also extended by three months.

### Trade Marks Act

As stated above, the Trade Marks Act, 1919, will come into operation on April 1, 1920. It amends the law of Trade Marks in several important respects.

Copies of the Patents and Designs Act, 1919, price 3d. each, by post 4½d., and of the Trade Marks Act, 1919, price 2d. each, by post 3d., can be obtained from the Patent Office Sale Branch, 25, Southampton Buildings, London, W.C.2.

### Rules v. Fees

In consequence of this legislation, amendments of the rules and fees are now being framed and notice will be given in the *Board of Trade Journal* when the Rules are published.

## Chemical Trade Inquiries

*The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, (S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.*

| Locality of Firm or Agent. | Materials. | Ref No. |
|---|---|---|
| Johannesburg ... | Refrigerating Plant ... ... ... | 945 |
| Belgium (Liege)... | Asbestos ... ... ... ... | 1,279 |
| Palestine (Haifa) | Window Glass, Lamp Glasses, &c. ... | 1,291 |

## Government Contracts

The following contracts were placed by the Government during November :—

### Admiralty (Director of Navy Contracts) Department

*Fireclay :* G. K. Harrison, Ltd., Stourbridge ; J. Dougall & Sons, Ltd., Bonnybridge.

*Soap :* J. Knight, Ltd., London ; McDougall Bros., Ltd., Manchester.

### Ministry of Munitions

*Chemicals :* Howards & Son, Ltd., Ilford ; May & Baker, London, S.W.

*Oils :* Anglo-American Oil Co., Ltd., London, S.W. ; W. B. Dick & Co., Ltd., London, E.C. ; London Lubricants, Ltd., London, E. Younghusband, Barnes & Co., London, S.E.

# From Week to Week

THE BOARD OF TRADE announce that Roumania has been added to the list of countries to which the Export Credits scheme applies.

MR. FRED CRAVEN, who was the oldest practising chemist and druggist in the Pontefract district, died last week.

WHILE ENGAGED in the erection of a new crane at the Yorkshire Dyeware Factory at Selby, Harry Peachey, of Bradford, fell to the ground and received injuries to his leg and arm.

Mr. D. J. LEWIS has been presented with a gold albert and medallion by the workmen of Vivian & Sons' Acid Works, Hafod, South Wales, in recognition of his work on behalf of soldiers at the front.

A LABORATORY at one of Messrs. Lister & Co.'s dyehouses at Manningham Mills, Bradford, was completely destroyed by fire on Sunday, and all the instruments it contained were destroyed.

THE LABOUR DISPUTES at the Chilean nitrate ports have been settled by the arbitration tribunals, at which the Government was represented and the nitrate shipping transport has been re-established.

IT IS OFFICIALLY ANNOUNCED that the report of an investigation under the Profiteering Act with regard to quinine is now in the hands of the printers and will be available in a few days. Other reports will be sent to the printers for publication immediately.

A QUANTITY OF NITRIC ACID caused a fire on Monday in the basement of the premises occupied by Messrs. Pitt & Scott, Ltd., at 25, Cannon Street, E.C. The fire was quickly extinguished by the City firemen, but two men were taken to hospital suffering from the effects of the fumes.

A VERDICT of accidental death was returned at the inquest held on Mr. C. W. Walwin, manager of the Bath branch of Boots' Cash Chemists, who died as the result of injuries received last Saturday while playing for the Bath Rugby Team against Cross Keys. Evidence was given by the referee and players that it was an absolutely clean game.

HUNDREDS OF WORKMEN are being displaced as a result of the amalgamation of the Scottish oil companies. Two hundred men were paid off on Saturday at the Uphall works belonging to Young's Oil Co., Ltd., one of the concerns now included in Scottish Oils, Ltd. The company's works and mines spread over a wide area, and the new policy will result in large economies.

THE THREATENED STRIKE of Scottish panel chemists has been averted by their acceptance of a compromise offer by the Board of Health of 5d. per prescription. The panel chemists claimed a dispensing fee, under the Insurance Act, of 6d. per prescription, the figure at present being 2d. The Board of Health offered a fee of 4d. The agreement represents a compromise between the two claims.

PROFESSOR H. G. GREENISH, Dean of the Pharmaceutical Society's School of Pharmacy, has been nominated by the Board of Professors of l'Ecole Supérieure de Pharmacie de Paris as one of five foreign men of science upon whom the University of Paris has decided to confer the diploma of "Docteur *honoris causa*" on the occasion of "Une Séance Solennelle de rentrée pour feter le retour desétudiants des diverses Facultés," on Saturday, December 20.

650 TONS of the 30,000 tons of "reparation" dyes due to the Allies under the Peace Treaty, have arrived in Manchester. The consignment is stated to consist of a large number of different kinds of dyes, and the opinion in the textile centres is that it will be helpful, but rather in the nature of a stop-gap. There are export orders which cannot be filled because of the absence from the market of certain fine dyes, and there will not be enough of these to go round.

SIR WILLIAM OSLER, who died on Monday at the age of 70 years, was Regius Professor of Medicine in the University of Oxford. He was created a baronet in 1911, held the degree of Hon. D.Sc. at the Universities of Oxford, Cambridge, Dublin, Liverpool, and Leeds; LL.D. at McGill, Toronto, Aberdeen, Edinburgh, Yale, Harvard, and Johns Hopkins Universities; D.C.L. at Durham and Trinity University, Toronto; Hon. M.D. at Christiania; and Hon. F.R.C.P. at Dublin.

MESSRS. LONGMANS have in the press, for publication at an early date, a volume on the life and work of Sir Jagadis Chandra Bose, the founder of the Bose Research Institute in Calcutta. An account is given of his early struggles, and chapters are devoted to the records of his scientific work. Sir J. C. Bose is the first native of India to obtain a European reputation in Physical Science. The volume has been written by Professor Patrick Geddes, formerly Professor of Botany, University College, Dundee, now of the Department of Sociology and Civics, Bombay University.

MR. LLOYD GEORGE visited the works of the British Aluminium Co. and the North Wales Power Co. in the Conway Valley on Tuesday. Replying to the toast of his health, he said we were the most backward nation in the utilisations of water. In Germany water-power had long been made use of in factories, in agriculture and for other purposes, and he hailed the advent of similar enterprises in this country. The secret of the future lay in the adequate exploitation of our great natural resources. Cheap power was the great necessity of our manufacturing life, and would revolutionise industry. Labour was demanding shorter hours, and something must be done to increase production. Commending the company for looking after the welfare of its workers, the Premier said that monotony and greyness had been the evils of our industrial life.

THE ITALIAN GOVERNMENT has decided to devote special attention, the *Board of Trade Journal* states, to the questions of industrial experiment stations and of technical education. Besides studying new processes and making new applications of old methods, these stations will supply the industries with a trained personnel. Five such stations have already been established—two at Milan, for paper and fats respectively; two at Naples, for leather and ceramics; and one at Reggio Calabria, for essential oils and perfumes. Itis planned to establish new stations as follows: At Rovigno, for the sugar industry; at Milan, for the development of the refrigerator industry, and a third probably at Rome, to study the distillation of gases and their by-products, and, in general, all the processes of combustion. The establishment of other stations will follow.

A INTERESTING PAPER on "The Direct Replacement of Glycerol in Fats by Higher Polyhydric Alcohols" is contributed to the *Biochemical Journal* for November by Professor A. Lapworth and Mr. L. K. Pearson. The work described is the outcome of an endeavour to convert the large quantities of fatty acids produced during the war in the manufacture of glycerol into an edible foodstuff. These authors found that when olein or stearin is distilled under reduced pressure with mannitol in the presence of a little sodium ethoxide almost the whole of the glycerol present in the original fatty compound is expelled, the greatest yield being attained when the proportion of fat to mannitol corresponds with two molecules of the former to three of the latter. The other products of the reaction are chiefly water, a little alcohol, and a substance many properties of which are similar to those of the original fat. The composition of this latter substance corresponds with that of a mixture of the di-oleates (or distearates) of mannitan and isomannide.

REPORTS are now in circulation concerning the suggested or proposed sale of German interests in nitrate mines in Chile. A banking firm at Hanover, according to the *Times Trade Supplement*, recently issued a circular referring to the course of the quotations for the shares of H. B. Sloman & Co., Saltpeterwerke, A.G., of Hamburg, and stated that an offer of £3,000,000 had been made for the company's mines and works in Chile. The company, however, now state that this "assumption does not correspond with the facts." On the other hand, the Copenhagen correspondent of *Norges Handels Tidende* announces that after negotiations extending over six months the Ostasiatisk Kompagni of Copenhagen has succeeded in reaching an agreement with the German syndicate which owns or partly owns various nitrate mines in South America, according to which the company will take over these undertakings. It is proposed to form a new company for this purpose, and storage warehouses will be erected at Copenhagen for dealing with the home consumption, while the exports from Chile will be directed chiefly to Siam, Japan, and China.

MR. DAVID GILMOUR, C.B.E., who took a prominent part in war work in this country, has been appointed president of the Standard Chemical Co., Ltd., Canada. Mr. Gilmour, who is a member of the Institution of Civil Engineers, has had considerable experience as a mining engineer in South Africa, South America and the United States. During the war he was attached to the British Department of Explosives Supply, and assisted in the designing and operation of many explosives plants. The control of the erection and operation of the largest munitions factory in the United Kingdom—H.M. Factory, Gretna—was placed in his hands, and, at the time of the armistice, he was co-ordinating all the activities relating to the large plant then in course of construction near Middlesboro for the manufacture of ammonium nitrate from synthetic ammonia. Just prior to joining the Standard Chemical Co. he was Director of the Factories Branch for the Department of Explosives Supply. He was also a member of a Commission sent by the War Office to France to investigate various labour questions in connection with the British Army's organisation in the field.

MR. R. R. NANCARROW, manager of the Lisburne Development Syndicate, Ltd., and the Welsh Mines Corporation, Ltd., in his evidence before the Non-Ferrous Mining Committee, said he thought there was a promising future for lead mining in this country. He suggested that State aid should take the form of a bonus of 7s. 6d. a foot on all approved development work, and of a minimum price for products got, in relation to the increase in mining costs since 1914. He proposed that such assistance should be given for five years. Mr. Horace Boot, of the Aberllyn Mines, Ltd., who represented the mines of the Conway Valley, said he was of opinion that help should be given to the industry by the guarantee of a market for blende at a reasonable price by an amendment of the system of royalties in vogue, and by the establishment of a Department of Mines to investigate and remedy the troubles of the mine owners. Professor O. T. James, of the University of Manchester, gave the Committee the benefit of the results of the investigations he has recently undertaken for the geological survey in the mining district of Cardiganshire and West Montgomeryshire. He expressed the view that new ore bodies could only be opened up in this dist by extensive prospecting and development.

# American Notes

### A New Dye

The National Aniline & Chemical Co., New York, announces the production of a new dye, known as Alizarine Orange R. P. Paste. As a wool colour it is said to possess " excellent fastness " to both light and washing. Dyed upon an alum mordant it produces orange, and combined with chrome a reddish brown. Because of its fastness to washing, it finds considerable application in calico printing.

### New Use for T.N.T.

When the armistice was signed the United States found itself with a surplus of 29,000,000 lb. of T.N.T., the bulk of which, the War Department thought, might be dropped into the sea. The Bureau of Mines, however, suggested that it would be possible to utilise the explosive for road and reclamation work in which the Government is interested, and all of it has now been allotted to this purpose. While under ordinary conditions it is improbable that T.N.T. could compete commercially with dynamite a great saving has been effected by the use of this surplus explosive.

### Dr. Moore Succeeds Dr. Parsons

Dr. Charles L. Parsons, who has resigned his post as chief chemist and chief mineral technologist of the U.S. Bureau of Mines, in order to take up work as a consulting chemist in Washington, and to give more time to the affairs of the American Chemical Society, will be succeeded by Dr. R. B. Moore, who has served as professor of chemistry at Butler College, as assistant chief of the chemical and physical investigation department of the U.S. Bureau of Soils, and as physical chemist to the U.S. Bureau of Mines in charge of the chemistry and metallurgy of rare metals. Both have done a considerable amount of research work. Dr. Parsons has given much attention to the production of nitric acid and nitrates by synthetic methods, and has been a consistent supporter of the Haber process as against the arc or cyanamide process. Dr. Moore was directly in charge of the radium work of the Bureau of Mines and of the radium plant in Denver with which the U.S. Government produced about a million dollars' worth of radium during its experimental work. He was in general charge during the war of three experimental helium plants operated under the control of the Bureau of Mines, and of the helium research laboratory. In addition he is the author of various Papers in connection with radio-activity, the rare gases, and rare metals.

### Developments in U.S. Glassware Industry

The United States has for some time past been giving much attention to the development of the glassware industry, and it is claimed that American works are producing chemical glassware of better quality than was ever imported before the war, and at no increase in price to the consumer. In addition to ornamental cut glass, in which Americans claim a certain pre-eminence, there has been considerable development in the production of selenium red for use in railway signal work, and of low-expansion, so-called heat-resisting, glass for railway lantern globes. American glass chemists, again, have developed non-potash glass, which is said to give better results than potash glass; and other glasses of which much is heard in America are those for the protection of operators of the electric-arc welding process and for X ray shields, while the Army medical authorities declare the American flasks and beakers to be the best supplied to them on service. Allowing something off these estimates for the American's belief in his own qualities, it is still clear that such progress is being made in the United States as English glassware firms cannot afford to ignore.

### American Potash Resources

In concluding a review of the potash industry in America, Mr. Arthur E. Wells estimates that during the next three or four years at least, the production of potash from the saline lakes will continue to be the greatest source of production. The total production of available potash which can confidently be expected during the next two years, if steps are taken to assure a market at a price of at least $2 per unit, is estimated at about 125,000 tons, obtained about as follows:—

| | |
|---|---|
| From saline lakes— | |
| Nebraska ... ... ... ... ... | 55,000 |
| California ... ... ... ... ... | 50,000 |
| Organic sources (waste molasses, beet sugar waste, wood ashes) ... ... ... ... ... | 6,000 |
| Cement industry ... ... ... ... ... | 8,000 |
| From blast furnace industry ... ... ... | 1,000 |
| Special types of silicate rocks and alunite ... | 6,000 |

It is quite reasonable, he states, to expect that with a good market at a price assured for a period of five years, a production of about 100,000 tons per year may be maintained, for, as the production from the Nebraska lakes begins to decrease the production from the California saline lakes, and also the cement plants, certain iron blast furnaces, the special types of silicate rocks, and the sugar and molasses wastes will gradually increase to take its place, and maintain the total. At the end of the five year period, it is expected that the California salines and most plants then equipped for the recovery of potash as a by-product, at cement plants, iron blast furnaces, and from organic waste materials, will be in a position to compete with German potash, and produce a minimum of 75,000 tons per year, unless the foreign potash is sold at a lower figure than is now believed to be likely. The above sources, at least, have a reasonable chance to survive and produce potash in competition with foreign potash as between $1.25 and $1.50 per unit, assuming that general industrial costs do not increase in that period. The indications are that at a pre-war price, however, there would be very small production, possibly 15,000 to 30,000 tons per year.

### Where Experts Differ

Dr. Charles H. Herty, who recently returned to America after a tour of inspection of the Badische plant and other dye works along the Rhine, takes a totally different view of the German dye industry from that held by Mr. Irving A. Keene, chairman of the Advisory Committee on Drugs, Chemicals, and Dyestuffs of the American Chamber of Commerce in London. Mr. Irving's opinion was that the Germans were not manufacturing dyes in sufficient quantities to be a menace to the industry in the United States. Dr. Herty, on the contrary, dismisses this opinion as of little value. " Germany," he says, " stands ready again to seize the dye trade of the world and to stifle American competition unless adequate legislation is passed. We found the executives at the Badische plant in a very comfortable mood. In the first few minutes of our interview with those officials, Director Krell volunteered the information that he had in hand orders from individual consumers with the authority from the United States Government to ship supplies through their American agents to the consumer. ' Yes,' said Director Krell, ' we are going to get back our old business in America, and through the medium of our former agencies.' We sat listening to this statement in the offices of the chief plant of that great combination of manufacturers whose former control of our dyestuff supplies had led Von Bernstoff to suggest to the Kaiser that through shutting off these supplies he could throw four million Americans out of employment. In spite of handicaps the German dye manufacturer is strong to-day. His plants are even greater than before the war, the personnel of those plants is practically intact, large stores of material are accumulated, and he is determined to regain his markets."

### Practical Training for Chemists

It is estimated, according to *Drug and Chemical Markets*, that there is one chemist for every 5,000 persons in the United States, and one chemical engineer for every 50,000 persons. When it is taken into consideration that one-quarter of the industries of the country depend upon the chemist or the chemical engineer the value of a thorough training along commercial, as well as theoretical, lines is apparent. Chemical manufacturers have endowed certain colleges in the United States to enable them to establish chemical plants and research laboratories. With this end in view, many colleges have equipped their laboratories with model manufacturing plants, where the student chemist and engineer has the opportunity to familiarise himself with plant operations. With this training the degree man is in a position to take hold of large scale operations, without going through the details that are generally required of students familiar with the theoretical side of chemistry only. One of the most complete courses in commercial chemistry, which is devoted more or less to plant operations and the study of coal-tar dyes, is that given at the Brooklyn Polytechnic Institute, Brooklyn, N. Y. The chemistry and chemical engineering courses at this school are combined. Manufacturing is carried on in the chemical engineering laboratory, which has been equipped to provide commercial units of all the various types of apparatus used in the chemical industry. The equipment includes filter presses, a precipitating tank, vacuum dryer and pump, a 300-ampere cell, a salt tank, a vacuum evaporator, a water still, which supplies distilled water to the thirteen laboratories; a column still of a capacity of 100 gallons, where mixtures are separated into their component parts for coal-tar products, medicinals, pharmaceuticals and dyes. An autoclave and motor are also included in the equipment. Manufacturing is carried on in this laboratory on a small scale and various products are produced from the raw material. One of the features of the chemical department is the Shaw qualitative and the general laboratories which have been fitted up to accommodate 234 students at a time. The organic laboratory is similar to a small plant. Experimental work with dyes and perfumes is carried on in this laboratory. In the coal-tar dye laboratory the student has an opportunity to experiment and test the various dyes. Other important features are the research laboratory; the physical laboratory, where a thermostat has been installed, in which substances may be kept within any desired temperature; a water analysis laboratory; a balance room and a quantitative laboratory equipped with drying ovens. The most important subjects for students desiring to become chemists are general chemistry in the first year, qualitative analysis in the second year, qualtitative analysis in the third year, and organic chemistry and coal-tar dyes in the fourth year, as well as investigation of important chemical subjects. The popularity of the course is evident from the fact that more than half the students in attendance at the Institute are enrolled in the chemistry courses. The number has more than doubled in the past three or four years.

# References to Current Literature

*Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used appeared in our issue of December 27 last.*

## British

ALCOHOL. By-product development in the iron and steel industry, with special reference to (*a*) recovery of potash from electrostatically deposited Cleveland blast-furnace dust; (*b*) fixation of ethylene present in coke-oven gas as alcohol and its derivatives. E. Bury and O. Ollander. *Gas J.*, December 30, 718-721. An important paper read before the Cleveland Institute of Engineers in which the best conditions for the formation of ethylene are discussed.

AMMONIA. Ammoniacal liquor as manure. F. Nielsen. *Gas J.*, December 23, 653. A record of successful fertilising experiments with crude liquor.

Reconstruction of a sulphate of ammonia plant. J. Poulson. *Gas J.*, December 23, 658-659. A paper read before the Midland Junior Gas Association on December 18.

ANALYSIS. Estimation of alkaline sulphide in dilute solutions. H. G. Bennett. *J. Soc. Leather Trade Chem.*, November, 190-193. The conditions for securing accuracy by the magnesium-distillation method are given.

COMBUSTION. The propagation of flame in complex gaseous mixtures. W. Payman. *Chem. Soc. Trans.*, December, 1430-1462. A series of three papers dealing with (I.) Limit mixtures and uniform movement of flame in such mixtures. (II.) Uniform movement of flame in mixtures of air with the paraffin hydrocarbons. (III.) Uniform movement of flame in mixtures of air with mixtures of methane, hydrogen and carbon monoxide, and with industrial inflammable gases.

FURNACES. Some gas furnace installations. H. R. Hess. *Gas World*, December 27, 518-520. A paper before the Midland Junior Gas Association on December 18.

GAS. Some technical problems of the future. T. B. Smith. *Gas J.* December 23, 660-661. The author discusses gas producers in conjunction with coke ovens, and the future for pitch.

Revivification of oxide in situ. O. B. Evans. *Gas J.*, December 30, 726. Paper read before the Annual Convention of the American Gas Association.

METHANE. The equilibrium between carbon, hydrogen and methane H. F. Coward and S. P. Wilson. *Chem. Soc. Trans.*, December 1380-1387.

PLANT. Conveyor installation at the Maypole Margarine factory. G. F. Zimmer, *Engineering*, December 26, 854-855, 858 and double-page plate. Conclusion of account already noted. (CHEMICAL AGE, p. 725.)

REFRACTORIES. Measurement of physical properties at high temperatures. A. G. Tarrant. Faraday Soc., December (advance proof); also *Engineering*, December 26, 875. Tests of thermal expansion, tensile strength and thermal conductivity are discussed.

STEAM. Calculations relating to high-pressure and high-temperature steam with interheating for power generation. W. M. Selvey. *J. Inst. Elect. Eng.*, December 31, 42. Valuable data are tabulated.

TOLUENE. Criteria of the degree of purity of commercial toluene. J. S. Lumsden. *Chem. Soc. Trans.*, December, 1366-1372.

## French

ALKALIS. The manufacture of chlorine and alkalis in the United States by modern electrolytic processes. E. Chaleyer. *Rev. Prod. Chim.*, December 15, 613-620. A useful description of the processes and apparatus now in use.

ANALYSIS. Rapid microchemical detections of soluble and insoluble mercury compounds. G. Denigès. *Ann. Chim. Analyt.*, December 15, 383-385.

APPARATUS. Laboratory distilling column, and method of measuring its efficiency. M. Robert. *Ann. Chim. Analyt.*, December 15, 372-377. A column is described for which a very high fractionating efficiency is claimed.

New viscosimeter for measuring viscosity and fluidity. G. Baume and H. Vigneron. *Ann. Chim. Analyt.*, December 15, 379-383.

## United States

ALCOHOLS. Symposium on industrial alcohols. *Chem. & Met. Eng.*, October 29-November 5, 557-559. A report of a series of papers read before the American Chemical Society on October 10, dealing with the manufacture and uses of various alcohols.

AMMONIUM CHLORIDE. The transition of dry ammonium chloride. A. Smith, H. Eastlack and G. Scatchard. *J. Amer. Chem. Soc.*, December, 1961-1969. Experiments on the decomposition of the salt by heat are described.

ANALYSIS. Applications of the interferometer in gas analysis. J. D. Edwards. *Chem. & Met. Eng.*, October 29-November 5, 560-565.

The electrolytic determination of the halogens: an indirect method. J. H. Reedy. *J. Amer. Chem. Soc.*, December, 1898-1902.

The rapid determination of carbon monoxide in air. A. B. Lamb and A. T. Larson. *J. Amer. Chem. Soc.*, December, 1908-1921.

COBALT. The passivity of cobalt. H. G. Byers and C. W. Thing. *J. Amer. Chem. Soc.*, December, 1902-1908.

ELECTRIC FURNACES. The electric furnace laboratory of the Bureau of Mines. C. D. Grier. *Chem. & Met. Eng.*, October 29-November 5, 574-576. An illustrated description of the laboratory.

The Booth electric rotating furnace. C. H. Booth. *Chem. & Met. Eng.*, November 12-19, 636-638.

EXPLOSIVES. Hygroscopicity of trinitrotoluene. W. J. Huff, *Chem. & Met. Eng.*, October 29-November 5, 570-571.

METALS. Philadelphia Meeting, American Institute of Metals. *Chem. & Met. Eng.*, October 29-November 5, 550-556. Reports of papers on nickel, zinc, aluminium alloys, manganin, constantan and gun-metal.

PAINTS. Aluminium corrosion as affected by basic pigments. H. A. Gardner. *Circ.* 79, *Paint Manufrs. Assoc., U.S.* 2 pp.

Pigments for galvanised iron primers. H. A. Gardner. *Circ.* 80, *Paint Manufrs. Assoc., U.S.* 2 pp.

PLANT. Industrial Excursions, American Chemical Society, September 2-6. *Chem. & Met. Eng.*, October 15, 488-502. Interesting accounts of the plants of the Atlantic Refining Co. (Mineral oils), R. H. Foederer (leather), Electric Storage Battery Co., Cedar Hollow Limekilns, Barrett Co. (tar) products and Welsbach Co.

POTASH. Wood ashes and the production of potash. E. Bateman. *Chem. & Met. Eng.*, November 12-19, 615-619. The potash contents of various woods are given, together with particulars of manufacture and cost of potash.

STEEL. Electrically-heated soaking pits in the steel industry. T. F. Baily. *Chem. & Met. Eng.*, November 12-19, 624-627.

Notes on the acid electric furnace process. L. B. Lindemuth. *Blast Fur. & Steel Plant*, December, 595-596.

Determination of sulphur and chromium in steel. L. A. Goldenburg. *Chem. & Met. Eng.*, November 12-19, 628. A method is described in which both elements are determined in the same sample.

WATER. Lime-barium softener for treatment of boiler feed water. C. A. Mehring. *Chem. & Met. Eng.*, November 12-19, 629-632. An account of a successful plant at the Chino Copper Company's works, Hurley, N.M.

ZINC. The zinc industry in Belgium. M. F. Chase. *Chem. & Met. Eng.*, October 29,-November 5, 571-573. The present position and prospects of the industry are discussed.

## German

ALKALIS. Progress of the inorganic heavy chemical industry during the war. *Chem. Zeit.*, November 29 and December 9, 833-836, 861-864. The literature on alkalis is reviewed. (*See also* CHEMICAL AGE, pp. 645, 696, 725.)

ANALYSIS. Indirect method for detecting zinc. F. Feigl. *Chem. Zeit.*, December 9, 861.

Application of silicotungstic acid in the quantitative estimation of alkaloids. E. Taigner. *Z. anal. Chem.*, Vol. 58, No. 8, 340-352.

BLAST-FURNACES. Contribution to the study of the reactions involved in the blast-furnace equilibrium. E. Terres and A. Pongracz. *Z. Elektrochem.*, December 1, 386-401.

CARBIDES. Gases from carbide furnaces. P. Schläpfer. *Z. Elektrochem.*, December 1, 409-414.

CONSOLIDATION. The consolidation of powder by pressure. T. von Hagen. *Z. Elektrochem.*, December 1, 375-386. Numerous experiments on the consolidation of various salts and mineral powders are recorded.

FOODS. Chemistry of foods and foodstuffs in 1917-1918. H. Kuttenbeuler. *Chem. Zeit.*, December 2 and 6, 841-843, 853-856. A review of the literature of the subject.

GASES. Electrical separation of solid and liquid particles from gases. R. Durrer. *Stahl u. Eisen*, December 11, 1546-1554. Conclusion of article already noted (CHEMICAL AGE, pp. 696, 725), with bibliography.

MINERAL OILS. The congealing of mineral oils. E. Lantos. *Chem. Zeit.*, December 6, 853. Notes on some anomalies in the effect of cold on mineral oils.

# Patent Literature

*We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acceptance is added, and abstracts are given as soon as possible.*

## Abstracts of Complete Specifications

114,845. HYDROCARBONS, PROCESS AND APPARATUS FOR THE CONTINUOUS AND UNIFORM TREATMENT OF—WITH SULPHUROUS ACID. Allgemeine Gesellschaft für Chemische Industrie, m.b.H., of 35, Unter den Linden, Berlin, W., Germany. International Convention date (Germany), March 21, 1917.

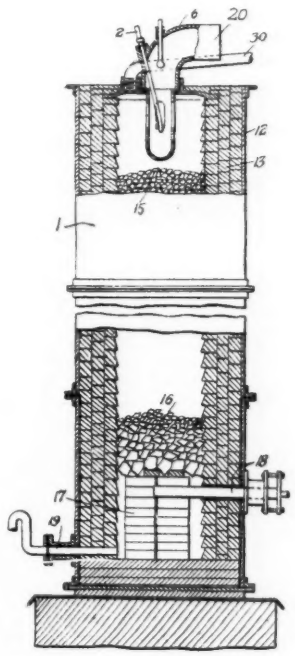
In the continuous treatment of hydrocarbons with liquid sulphurous acid it is desirable to obtain a uniform evaporation of the sulphurous acid from the two fractions of the hydrocarbon which are obtained. The two fractions flow continuously from a mixer into a series of vessels in which the sulphurous acid is evaporated by reduced pressure and/or heat. To ensure uniform evaporation a constant liquid level should be maintained in the evaporators, and in order to obtain a correct reading in a gauge glass of the level of the liquid during ebullition, the gauge glass is fitted to an auxiliary vessel. This vessel is connected to the evaporator by two pipes, one connecting the vapour spaces and the other the liquid spaces; the auxiliary vessel is not heated.

122,405. CARBOHYDRATES, METHOD OF TREATMENT OF RESIDUES CONTAINING. J. Effront, 73, Avenue Solsboch, Brussels; and A. Boidin, 270, Rue de Vaugirard, Paris. International Convention date (France), January 17, 1918.

The process is for the treatment of certain gums or celluloses contained in industrial residues such as those of the starch, brewing, and oil industries. The residues are subjected to the action of bacterian diastases obtained as described in Patent No. 16,198 of 1914. These diastases differ from those of malt, and act only in an alkaline medium. The treatment is continued for half-an-hour to one hour at a temperature of 70° to 85°C., and the saccharification is then arrested by neutralising the material or raising it to 100°C. The liquid is then filtered, decolorised by animal charcoal, and evaporated. The final product is a white or yellow syrup containing about 70 per cent. of dextrine and 30 per cent. of a mixture of glucose and maltose; it crystallises into a dry, non-hygroscopic product, and possesses the flavour of honey.

135,535. NITRIC ACID, PROCESS OF CONCENTRATING—AND APPARATUS FOR USE IN CONNECTION THEREWITH. E. C. R. Marks, London. (From E. I. du Pont de Nemours & Co., Wilmington, Del., U.S.A.). Application date, September 6, 1918.

The process is for treating mixtures of nitric acid and sulphuric acid containing not less than 64 per cent. of sulphuric acid and from 3 to 25 per cent. of nitric acid. The mixed acid is supplied by a pipe 2 to the top of the tower 1, having a height of about 24 ft. and internal diameter of 21 in. The distributor 9 is provided with a number of small openings 11 for the mixed acids and with larger openings 10 for the exit of nitric acid vapour and steam. The tower 1 is composed of a steel casing 12 lined internally with bricks 13, and is filled with pieces of quartz or similar material 15, of a uniform diameter of 2 in. to 3 in. These pieces of quartz rest on larger blocks of quartz 16, supported by a number of overlapping bricks 17, having a space for a steam inlet pipe 18. The temperature at the top of the tower is kept between 195°F. and 215°F., preferably 205°F., and nitric acid vapour and some steam pass out through the pipe 6, the greater part of the steam being absorbed by the sulphuric acid. The sulphuric acid is drawn off through pipe 19. The vapours pass through the pipe 20 to a condensing coil surrounded by cold water, and the condensed nitric acid is collected at the outlet. Any uncondensed vapour at the outlet of the condensing coil is conveyed by a pipe to an absorption tower, and subjected to a current of water. The dilute nitric acid thus formed is conveyed by the pipe 30 to the top of the tower 1, and subjected to concentration, together with a further quantity of the mixed acid The mixed acid obtained from the nitration of cellulose may be treated in this manner.




135,535

135,544. MIXING TOGETHER VARIOUS MATERIALS FOR THE DRY MIXING OF CONCRETE AGGREGATES AND MATERIALS OF A SIMILAR NATURE, APPARATUS FOR. T. Lea, Rookery House, Lanesfield, Wolverhampton. Application date, April 16, 1919.

The dry ingredients pass downwards through a conical funnel and are discharged on to the apex of an upright cone immediately below. The materials pass over the surface of this cone and are discharged on to the upper surface of another conical funnel, through which they pass to complete the mixing. The upright cone may be stationary or may be rotated about its vertical axis by bevel gearing.

135,545. POTASSIUM SULPHATE, PROCESS FOR THE MANUFACTURE AND PRODUCTION OF. E. E. Dutt and P. C. Dutt, Jubbulpore, India. Application date, October 18, 1918.

Silicate rocks such as feldspar are treated for the production of potassium fluoride, and subsequently potassium sulphate. Two rotary furnace chambers are placed end to end, and a charge of potassium fluoride and silica is placed in one chamber and heated to bright redness, sulphur dioxide and steam being then passed over the mixture. Potassium sulphate is formed together with a gaseous mixture of silicon tetrafluoride and hydrogen. The gases pass into the other furnace chamber which contains a charge of feldspar also heated to bright redness, and the silicon tetrafluoride re-acts with the feldspar, producing potassium fluoride together with insoluble compounds. The product is lixiviated with water to dissolve the potassium fluoride, which may then be crystallised and used for the reaction in the first chamber. The potassium sulphate may be similarly extracted with water.

35,577. Coal, Water, and other Gases, Treatment of—and Removal of Substances Contained Therein. A. J. Pennington, Oakley, Fallowfield, Manchester; and M. C. Lamb, 176, Tower Bridge Road, London, S.E.1. Application date, November 25, 1918.

The calorific and luminous power of coal gas is improved by mixing with it the hydrocarbon gases and volatile fractions, obtained from the destructive distillation of bones or leather. The condensed oils of the pyridene and analogous series obtained by the destructive distillation of bones or leather may be employed as solvents to extract the naphthalene, anthracene, and similar substances from coal gas, and thus avoid the difficulty which sometimes occurs through the choking of gas pipes by the deposition of these substances.

135,578. Cellulose—Containing Materials, Treatment of. N. Testrup and Wetcarbonizing, Ltd., 47, Victoria Street, Westminster, London, S.W.1. Application date, November 25, 1918.

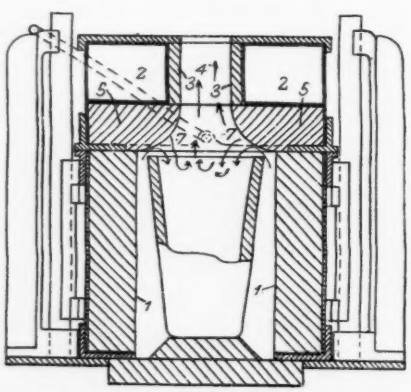
Material such as peat is wet carbonised at a low temperature with the addition of an acid to hydrolise the cellulose. The treated material is then subjected to filter pressing and the effluent is evaporated. The acid is recovered from the steam or the evaporator residue, and is used for treating a fresh quantity of peat. The acid is recovered by the vapour compression evaporating method, described in Patents Nos. 12,462 and 22,670, of 1911. The vapour from which the acid has been removed may be used as the heating medium for the evaporating chamber, and the heat contained in the condensate of the evaporator may be transferred to the raw material which is to be treated.

135,614. Lactose or Milk Sugar, Manufacture of. G. Martin, The Co-Operative Wholesale Society, Ltd., 109, Corporation Street, Manchester. Application dates, November 28 and December 30, 1918.

The whey obtained in the manufacture of cheese is evaporated *in vacuo* to at least half and preferably to one-fifth of its bulk. The liquid is then heated to 70°-100°C. to coagulate the greater part of the albumen which is removed by skimming or decantation, and the remaining albumen is precipitated by adding a sufficient quantity of metaphosphoric acid. Any excess of acid in the whey is then neutralised with sodium or calcium carbonate, or lime, and the liquor is concentrated, and the lactose or milk sugar crystallised in the usual manner. The product obtained in this manner is stated to be purer and easier to manipulate than that obtained by the ordinary method.

135,620. Crucible Furnaces. W. A. Shilton, Alvaston, Little Heath Road, Coventry; and R. A. Munden, 54, Styvechale Road, Coventry. Application date, October 17, 1918.

The heating chamber 1 of the furnace is surmounted by a refractory slab 5, over which an annular pre-heating chamber




135,620

2 for the air supply is arranged. The chamber 2 is constructed of sheet metal, and the central aperture 4 is lined with refractory material 3. The refractory slab 5 is formed with shoulders 7 to deflect the rising flames into the crucible. The annular chamber 2 is provided with an airtight radial partition, and the cold air under pressure is directed against the hot inner wall close to one side of the partition, afterwards passing round the chamber to the outlet on the other side of the partition. The chamber 2 may be provided with internal vanes to increase its heating surface. The upper part of the furnace casing containing the chamber 2 is made detachable from the lower part, and may be lifted off when required. The crucible is heated by gas or hydrocarbon burners projecting through the wall 1.

135,639. Electric Metallurgical Furnaces. W. E. Moore, Union Bank Building, Pittsburgh, Pa., U.S.A. Application date, December 7, 1918.

An electric induction furnace is provided with two downwardly extended U-shaped channels the ends of which communicate with the interior of the furnace. The central axis of the U-shape is inclined outwards and the cross-section of the loop channel is oval and relatively small. The channel gradually expands upwards to its junction with the furnace. The loops enclose electrical heating coils wound on cores having external laminated yokes, and the coils are excited from two separate transformers. This construction produces a rapid circulation of molten material in the loop channels and reduces the "pinch" effect usually experienced when employing the high current densities necessary for rapid heating. Three arcing electrodes project downwards through the roof, and are connected to a three-phase alternating current.

135,643. Gas Producers. D. J. Smith, 40, Woodberry Grove, Finsbury Park, London, N.4. Application date, December 9, 1918.

A fuel hopper and a smoke flue are arranged adjacent to one another above a gas producer, but their lower ends terminate some distance above the top of the producer, which has only a single aperture in the top. Two short connecting pipes are mounted on a vertical pivot, and either may be swung into position to connect the hopper or the smoke flue to the aperture in the producer.

135,674. Electric Furnaces. E. Waring and W. Waring, 66, Leeds Road, Sheffield. Application date, December 31, 1918.

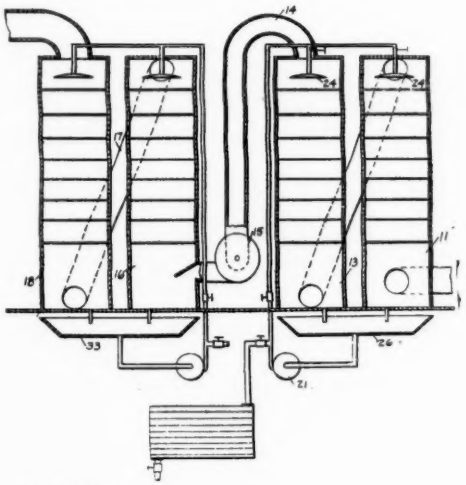
The furnace is constructed with an annular recess in the hearth surrounding a central upwardly projecting portion. The electrodes are embedded in the hearth and are arranged in groups. The arrangement comprises one ring of electrodes near the outer wall, and another ring at the bottom of the recess, while another set of groups radiate from the centre. The arrangement of electrodes and shape of the hearth ensure a uniform heating and efficient mixing of the material.

135,713 and 135,720. Potassium in the Form of Nitrate, Process for the Recovery of—from the Waste Gases of Cement Kilns and the Like. H. Fairbrother, London (From the Chemical Construction Company, Los Angeles, Cal., U.S.A.). Application dates, February 20 and February 24, 1919.

135,713. The waste gases from a cement kiln, which contain potassium oxide and silicate and calcium oxide and carbonate in suspension, and also carbon dioxide, are passed through a tower through which a metal nitrate, preferably sodium nitrate, is passed in counter-current. The gases re-act with the nitrate solution, forming potassium nitrate, sodium and potassium carbonates, hydrosilicates and hydroxides. The mixture is removed at intervals and evaporated to dryness to render the gelatinous silicates insoluble, and the sodium carbonate and potassium nitrate are then dissolved and filtered out. The sodium carbonate and potassium nitrate are separated by crystallisation.

135,720. Hot gases from a cement kiln are passed through two towers 11 and 13 in series, through which water or an aqueous solution of sodium, potassium, or aluminium silicates is also circulated by a pump 21 and spray nozzles 24. The cement dust and about 50 per cent. of the potassium oxide are extracted, and the gas is then passed through a conduit 14, centrifugal fan 15, and two additional towers 16 and 18 in series, through which sulphuric, hydrochloric, boric, or nitric

acid is circulated. The potassium is extracted as a substantially pure salt from the liquor in the tank 33. The slurry from the first pair of towers is collected from the tank 26 and treated for the recovery of the potassium compounds.



135,720

## International Specifications Not Yet Accepted

134,207. CRYSTALLISING. Norsk Hydro-Elektrisk Kvaelstofaktieselskab, 7, Solligatan, Christiania. International Convention date, October 23, 1918.

Liquid to be crystallised is passed through a horizontal tube rotating on its axis and provided with longitudinal ribs projecting radially outward. The tube is heated at the upper part and cooled at the lower part by contact with hot and cold fluid respectively.

134,214. SODIUM SULPHATE. Salzwerk Heilbronn, Heilbron on the Neckar, Germany. International Convention date, January 24, 1918.

Nitre cake and common salt are added to a bath of fused sodium sulphate or common salt, and sodium sulphate and hydrochloric acid are formed by the reaction. Impurities may be separated by blowing air or steam through, or by adding lime, baryta, sodium carbonate, or natron. The hydrochloric acid may be purified by passing it over common salt, thereby heating the latter. The cooled product is sprayed with water to produce hydrated sodium sulphate.

134,223. EMULSIFIABLE OR SOLUBLE OILS. M. Melamid, 56, Lorettostrasse; and L. Grotzinger, 46, Thurnseestrasse; both in Freiburg i/Breisgau, Germany. International Convention date, October 31, 1917.

To render oils soluble or emulsifiable in water the usual additions of saponified fatty acids or sulphonated oils are replaced by compounds of the acid constituents of tar or pitch, with basic substances such as lyes or pyridine. Slight modifications of this process are also described. The final solutions or emulsions may be used for treating metals or textiles, for medicinal purposes, for wool lubricants, &c.

134,228. FILTERS FOR LIQUIDS AND GASES. E. de Haen Chemische Fabrik List Ges., Seelze, near Hanover, Germany. International Convention date, December 4, 1917.

The filter is capable of separating minute particles such as bacteria and colloidal substances from liquids, or suspended particles from gases. A cellulose "ether" is dissolved in a suitable solvent and spread into a film, and the solvent evaporated in a moist atmosphere, or alternatively, water may be added to the solution before evaporation. As an example, celloidine may be dissolved in a mixture of glacial acetic acid and acetone, the solution spread on a glass plate, and the solvent evaporated in an atmosphere of 60 per cent. humidity at 18°C. Other solvent mixtures are also described. The permeability of the membrane may be varied within wide limits by varying the composition of the cellulose "ether" solution, or the humidity of the atmosphere. The membrane may be supported on a porous or perforated plate.

134,229. NITRIC ACID. L. A. Mage (*known as Nouguier*), 3, Rue d'Entraigues, Tours, Indre-et-Loire, France. International Convention date, October 24, 1918.

The process is for the synthetic production of nitric acid by the action of electric discharges on a mixture of air and water vapour. The air may be ozonised in an apparatus, the electrodes in which consist of a series of metal blades separated by insulating material and clamped together. The frames thus formed are assembled together into a structure through which the air is passed. The same apparatus may be used for the actual synthesis if the blades are constructed of aluminium or an aluminium alloy, with acid-resisting insulation. Alternatively, carbon electrodes may be used. The construction of the electrodes is described in detail. The production of nitric acid may be increased by (1) ozonising the air when dry; (2) supersaturating the air with water vapour; (3) heating the moistened air to 50°C.; (4) rapidly circulating the reacting gases; (5) by a combination of these methods.

### LATEST NOTIFICATIONS.

136,543. Silica Gels, and Process of Making the Same. W. A. Patrick. December 7, 1918.

136,564. Perylene, Method of Making. F. Hansgirg. February 26, 1918.

136,573. Centrifugal Atomisers. Maschinenbau-Akt.-Ges. Balcke Abteilung Moll. October 13, 1916.

136,574. Acetic Anhydride, Manufacture of. H. Dreyfus. June 30, 1914.

### FOREIGN PATENTS.

Attention is drawn to a law passed by the Roumanian Government on August 29, 1919, extending the time for lodging applications for a "Patent of Importation" in Roumania in respect of inventions of subjects of Allied and neutral countries patented between August 15, 1916, and six months after the conclusion of peace.

## Specifications Accepted, with Date of Application

105,769. Desoxycholic Acid, Process for the Manufacture of Products of addition of. H. Wieland. February 10, 1916

122,170. Pigment Zinc Oxide, Preparing. American Zinc, Lead & Smelting Co. January 9, 1918.

124,762. Ammonia, Apparatus for the Synthetic Production of. General Chemical Co. November 3, 1917.

126,303. Manganese and its Alloys, Manufacture of—in the Electric Furnace. C. L. Lenoir. January 8, 1914.

130,992. Fractional Distillation, Apparatus for. E. A. R. Chenard. August 5, 1918.

134,521. Alcohol, Manufacture of. Elektrizitatswerk Lonza. October 27, 1918.

135,889. Nitrogen, Process for Effecting the Fixation of Atmospheric—and the Production of Ammonia. E. W. Haslup. October 24, 1918.

135,931. Purifying Gas and Obtaining Valuable By-Products Therefrom, Methods of and Apparatus for. F. A. Umsted. December 3, 1918.

135,955. Impact Grinders. W. S. Barron and G. S. Barron. December 6, 1918.

135,959. Gas-producing Plant. W. Climie and W. Lees. December 9, 1918.

135,968. Lead and Silver, Recovery of—from Sulphide Ores and Metallurgical Products. Amalgamated Zinc (De Bavay's), Ltd., and S. Ganelin. December 12, 1918.

135,976. Filter Presses. R. W. Webster. December 17, 1918.

135,987. Ortho and Para-Toluene-Sulpho-Chlorides, Process for separating. F. E. Matthews and E. H. Strange. December 20, 1918.

135,992. Separating Solid Particles of Matter from Liquids, Apparatus for. W. Acton. December 30, 1918.

136,034. Electric Arc Furnaces. W. E. Moore. February 13, 1919.

136,076. Sintering Concentrates, Distilling Shale, and the like, Apparatus for. J. M. Berglund. April 17, 1919.

# Market Report and Current Prices

*Our Market Report and Current Prices are exclusive to* THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

## British Market Report

THURSDAY, January 1, 1920.

Considering the holiday period, business has opened very satisfactorily, there being an accumulation of inquiries for export. Scottish consumers are anxious to get supplies to their works for use after the usual New Year stoppage.

Values on the whole show practically no change from those last reported, but are almost without exception strong, and with an upward tendency.

### General Chemicals

ACID ACETIC is extremely active and higher prices are anticipated.

ACID CARBOLIC.—This material is now becoming extremely scarce, and high prices have to be paid for delivery over the early months of next year.

ACID FORMIC is in fair demand, but the high price militates against any large volume of business.

ACID OXALIC is extremely scarce, and with practically no foreign supplies arriving it would seem that still higher prices are to be looked for.

AMMONIUM SALTS continue scarce, and it is impossible to obtain some products for near delivery.

ARSENIC is without change in value, and the undertone is very firm.

BARIUM SALTS are a better market, and higher prices have been paid for chloride.

BLEACHING POWDER is an active market, but very little material is offering, and resale parcels are changing hands at a premium.

FORMALDEHYDE is practically unobtainable on the spot, and odd parcels as they are offered are eagerly snapped up at high figures.

IRON SULPHATE (GREEN COPPERAS) is dull.

LEAD ACETATE is in much better demand, and price is higher.

LITHOPONE is scarce on the spot, and higher in value. The Dutch makers appear now to be well sold, and with America unable to compete at prevailing levels, it would seem that this market is bound to go higher.

POTASSIUM BICHROMATE continues active.

POTASSIUM CARBONATE is a shade easier, but there is no inclination to sell on the part of holders.

POTASSIUM CAUSTIC is in very short supply, and without change in nominal price.

POTASSIUM CHLORATE is still an easy market, and price tends to decline.

POTASSIUM PRUSSIATE.—English makers hold firmly to their price, and there is very little Continental make arriving.

POTASSIUM PERMANGANATE is very firm, and better business is reported for the B.P. article.

SODIUM ACETATE is relatively quite active and price firmer.

SODIUM BICARBONATE is not so active, but price remains steady.

SODIUM CAUSTIC continues firm and scarce. The few re-sale parcels that appear on the market are quickly sold.

SODIUM CHLORATE is a little steadier than has been the case of late, but only small business is passing.

SODIUM HYPOSULPHITE is extremely scarce and firm in price.

SODIUM NITRITE is higher, and makers expect a further advance in the near future.

SODIUM PHOSPHATE is moving off fairly well, and price tends to advance.

SODIUM PRUSSIATE is without change in value, but little material can be obtained for prompt delivery. Makers hold firmly to their price for delivery next year.

SODIUM SULPHIDE is in better request, and higher in price.

TIN SALTS are firmer, in sympathy with the metal.

ZINC SALTS are fairly active, without material change in price.

### Coal Tar Intermediates

This is a most difficult market, as makers are practically fully sold for the majority of products, and the demand far exceeds the supply. Manufacturing difficulties have occurred with a number of products, but it is hoped that these will be overcome shortly. Export licences for all intermediates are suspended for the time being, and this may give the desired relief.

ACETANILIDE is a higher market, but further supplies are expected shortly from America.

ANILINE OIL continues very firm, and in short supply.

ANILINE SALT is unobtainable for near delivery, but with the temporary refusal of export licences the position may become easier shortly.

BETA NAPHTHOL.—Makers are all very heavily sold, but the price is nominally without change.

PARANITRANILINE is practically unobtainable for near delivery.

PARAPHENYLENEDIAMINE is easier in price.

SALICYLIC ACID is moving off steadily at last quoted figures.

### Coal Tar Products

The market remains very firm, and the demand on the whole is very fair.

90 PER CENT. BENZOL remains active at a price of about 2s. 1½d. to 2s. 2d. f.o.r.

CRESYLIC ACID is still in good demand. Price is about 3s. for 97/99 per cent., while for 95/97 per cent. the price is about 2s. 6d.

CREOSOTE OIL is in very good demand. The price on rails, makers' works, is about 7½d.

NAPHTHALENE.—There is a fair amount of business being done in the different qualities of naphthalene. The price for refined remains at £18 to £20 per ton, and for crude at £7. 10s. to £9.

SOLVENT NAPHTHA remains in the region of 2s. 10d. to 3s.

HEAVY NAPHTHA.—Price to-day is about 2s. 6d.

PITCH.—The market remains firm with strong demand, and prices are steadily advancing. London is quoted 100s., East Coast Ports 92s. 6d., and West Coast Ports 87s. 6d.

### Sulphate of Ammonia

There is no change in the position. The Home demand absorbs the whole of the production, and no export sales have been reported for prompt shipment. Some business has been done for export during April-June next at about £28 per ton f.o.b. U.K.

## Current Prices

### Chemicals

| | per | £ | s. | d. | | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|
| Acetic anhydride | lb. | 0 | 2 | 9 | to | 0 | 3 | 0 |
| Acetone oil | ton | 77 | 0 | 0 | to | 80 | 0 | 0 |
| Acetone, pure | ton | 90 | 0 | 0 | to | 95 | 0 | 0 |
| Acid, Acetic, glacial, 99-100% | ton | 83 | 0 | 0 | to | 85 | 0 | 0 |
| Acetic, 80% pure | ton | 67 | 10 | 0 | to | 70 | 0 | 0 |
| Arsenic | ton | 65 | 0 | 0 | to | 70 | 0 | 0 |
| Boric, cryst. | ton | 72 | 10 | 0 | to | 73 | 10 | 0 |
| Carbolic, cryst. 39-40% | lb. | 0 | 0 | 9 | to | 0 | 0 | 9½ |
| Citric | lb. | 0 | 4 | 3 | to | 0 | 4 | 4 |
| Formic, 90% | ton | 105 | 0 | 0 | to | 110 | 0 | 0 |
| Gallic, pure | lb. | 0 | 6 | 6 | to | 0 | 6 | 9 |
| Hydrofluoric | lb. | 0 | 0 | 7 | to | 0 | 0 | 8 |
| Lactic, 50 vol. | ton | 70 | 0 | 0 | to | 72 | 0 | 0 |
| Lactic, 60 vol. | ton | 85 | 0 | 0 | to | 87 | 10 | 0 |
| Nitric, 80 Tw. | ton | 37 | 0 | 0 | to | 39 | 0 | 0 |
| Oxalic | lb. | 0 | 1 | 5½ | to | 0 | 1 | 6½ |
| Phosphoric, 1.5 | ton | 43 | 0 | 0 | to | 45 | 0 | 0 |
| Acid, Pyrogallic, cryst. | lb. | 0 | 11 | 6 | to | 0 | 11 | 9 |
| Salicylic, Technical | lb. | 0 | 2 | 0 | to | 0 | 2 | 2 |
| Salicylic, B.P. | lb. | 0 | 2 | 9 | to | 0 | 3 | 0 |
| Sulphuric, 92-93% | ton | 7 | 10 | 0 | to | 8 | 0 | 0 |
| Tannic, commercial | lb. | 0 | 3 | 6 | to | 0 | 3 | 9 |
| Tartaric | lb. | 0 | 3 | 2 | to | 0 | 3 | 3 |
| Alum, lump | ton | 19 | 0 | 0 | to | 19 | 10 | 0 |
| Alum, chrome | ton | 93 | 0 | 0 | to | 95 | 0 | 0 |
| Alumino ferric | ton | 9 | 0 | 0 | to | 9 | 10 | 0 |
| Aluminium, sulphate, 14-15% | ton | 15 | 0 | 0 | to | 15 | 10 | 0 |
| Aluminium, sulphate, 17-18% | ton | 18 | 10 | 0 | to | 19 | 0 | 0 |
| Ammonia, anhydrous | lb. | 0 | 1 | 9 | to | 0 | 2 | 0 |
| Ammonia, .880 | ton | 32 | 10 | 0 | to | 37 | 10 | 0 |
| Ammonia, .920 | ton | 20 | 0 | 0 | to | 24 | 0 | 0 |
| Ammonia, carbonate | lb. | 0 | 0 | 7½ | to | — | | |
| Ammonia, chloride | ton | 70 | 0 | 0 | to | 75 | 0 | 0 |
| Ammonia, muriate (galvanisers) | ton | 47 | 0 | 0 | to | 50 | 0 | 0 |
| Ammonia, nitrate | ton | 45 | 0 | 0 | to | 50 | 0 | 0 |
| Ammonia, phosphate | ton | 115 | 0 | 0 | to | 120 | 0 | 0 |
| Ammonia, sulphocyanide | lb. | 0 | 1 | 10 | to | 0 | 2 | 0 |
| Amyl, acetate | ton | 310 | 0 | 0 | to | 315 | 0 | 0 |
| Arsenic, white, powdered | ton | 65 | 0 | 0 | to | 67 | 0 | 0 |

| | per | £ | s. | d. | | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|
| Barium, carbonate | ton | 13 | 0 | 0 | to | 14 | 0 | 0 |
| Barium, carbonate, 2- 4% | ton | 13 | 10 | 0 | to | 14 | 10 | 0 |
| Chlorate | lb. | 0 | 1 | 3 | to | 0 | 1 | 4 |
| Chloride | ton | 22 | 0 | 0 | to | 23 | 0 | 0 |
| Nitrate | ton | 50 | 0 | 0 | to | 51 | 0 | 0 |
| Sulphate, blanc fixe, dry | ton | 25 | 10 | 0 | to | 26 | 0 | 0 |
| Sulphate, blanc fixe, pulp | ton | 15 | 10 | 0 | to | 16 | 0 | 0 |
| Bleaching powder, 35-37% | ton | 17 | 10 | 0 | to | 18 | 0 | 0 |
| Borax crystals | ton | 39 | 0 | 0 | to | 40 | 0 | 0 |
| Calcium acetate, grey | ton | 23 | 0 | 0 | to | 25 | 0 | 0 |
| Carbide | ton | 28 | 0 | 0 | to | 30 | 0 | 0 |
| Chloride | ton | 9 | 0 | 0 | to | 9 | 10 | 0 |
| Carbon bisulphide | ton | 58 | 0 | 0 | to | 59 | 0 | 0 |
| Casein, technical | ton | 80 | 0 | 0 | to | 83 | 0 | 0 |
| Cerium oxalate | lb. | 0 | 3 | 9 | to | 0 | 4 | 0 |
| Chromium acetate | lb. | 0 | 1 | 0 | to | 0 | 1 | 2 |
| Cobalt acetate | lb. | 0 | 7 | 0 | to | 0 | 7 | 6 |
| Oxide, black | lb. | 0 | 7 | 9 | to | 0 | 8 | 0 |
| Copper chloride | lb. | 0 | 1 | 3 | to | 0 | 1 | 6 |
| Sulphate | ton | 42 | 0 | 0 | to | 43 | 0 | 0 |
| Cream Tartar, 98-100% | ton | 245 | 0 | 0 | to | 250 | 0 | 0 |
| Epsom salts (*see* Magnesium sulphate) | | | | | | | | |
| Formaldehyde 40% vol | ton | 185 | 0 | 0 | to | 195 | 0 | 0 |
| Formusol (Rongalite) | lb. | 0 | 4 | 0 | to | 0 | 4 | 3 |
| Glauber salts | ton | 3 | 10 | 0 | to | 3 | 15 | 0 |
| Glycerine, crude | ton | 70 | 0 | 0 | to | 72 | 10 | 0 |
| Hydrogen peroxide, 12 vols. | gal. | 0 | 2 | 8 | to | 0 | 2 | 9 |
| Iron perchloride | ton | 40 | 0 | 0 | to | 42 | 0 | 0 |
| Iron sulphate (Copperas) | ton | 4 | 10 | 0 | to | 4 | 15 | 0 |
| Lead acetate, white | ton | 83 | 0 | 0 | to | 85 | 0 | 0 |
| Carbonate (White Lead) | ton | 58 | 0 | 0 | to | 61 | 0 | 0 |
| Nitrate | ton | 62 | 0 | 0 | to | 63 | 0 | 0 |
| Litharge | ton | 50 | 0 | 0 | to | 52 | 0 | 0 |
| Lithophone, 30% | ton | 47 | 10 | 0 | to | 50 | 0 | 0 |
| Magnesium chloride | ton | 15 | 10 | 0 | to | 16 | 10 | 0 |
| Carbonate, light | cwt. | 2 | 15 | 0 | to | 3 | 0 | 0 |
| Sulphate (Epsom salts commercial) | ton | 12 | 0 | 0 | to | 12 | 10 | 0 |
| Sulphate (Druggists') | ton | 17 | 10 | 0 | to | 18 | 0 | 0 |
| Methyl acetone | ton | 89 | 0 | 0 | to | 90 | 0 | 0 |
| Alcohol, 1% acetone | gall. | 0 | 11 | 6 | to | 0 | 12 | 0 |
| Nickel ammonium sulphate, single salt | ton | 47 | 10 | 0 | to | 52 | 10 | 0 |
| Potassium bichromate | lb. | 0 | 1 | 6 | to | 0 | 1 | 7 |
| Carbonate, 90% | ton | 102 | 0 | 0 | to | 105 | 0 | 0 |
| Chloride | ton | Nominal. | | | | | | |
| Potassium Chlorate | lb. | 0 | 1 | 2 | to | 0 | 1 | 3 |
| Meta-bisulphate, 50-52% | ton | 250 | 0 | 0 | to | 260 | 0 | 0 |
| Nitrate, refined | ton | 65 | 0 | 0 | to | 67 | 10 | 0 |
| Permanganate | lb. | 0 | 3 | 6 | to | 0 | 3 | 9 |
| Prussiate, red | lb. | 0 | 6 | 0 | to | 0 | 6 | 3 |
| Prussiate, yellow | lb. | 0 | 1 | 11 | to | 0 | 2 | 0 |
| Sulphate, 90% | ton | 31 | 0 | 0 | to | 33 | 0 | 0 |
| Salammoniac, firsts | cwt. | 4 | 15 | 0 | to | | — | |
| Seconds | cwt. | 4 | 10 | 0 | to | | — | |
| Sodium acetate | ton | 50 | 0 | 0 | to | 53 | 0 | 0 |
| Arsenate, 45% | ton | 50 | 0 | 0 | to | 52 | 0 | 0 |
| Bicarbonate | ton | 10 | 10 | 0 | to | 11 | 10 | 0 |
| Bichromate | lb. | 0 | 0 | 11 | to | 0 | 0 | 11½ |
| Bisulphite, 60-62% | ton | 34 | 10 | 0 | to | 35 | 10 | 0 |
| Chlorate | lb. | 0 | 0 | 6 | to | 0 | 0 | 6¼ |
| Caustic, 70% | ton | 27 | 10 | 0 | to | 28 | 10 | 0 |
| Caustic, 76% | ton | 28 | 0 | 0 | to | 28 | 10 | 0 |
| Hydrosulphite, powder, 85%. | lb. | 0 | 3 | 3 | to | 0 | 3 | 6 |
| Hyposulphite, commercial | ton | 20 | 10 | 0 | to | 21 | 0 | 0 |
| Nitrite, 96-98% | ton | 65 | 0 | 0 | to | 67 | 10 | 0 |
| Phosphate, crystal | ton | 35 | 0 | 0 | to | 37 | 0 | 0 |
| Sodium, Perborate | lb. | 0 | 2 | 2 | to | 0 | 2 | 4 |
| Prussiate | lb. | 0 | 1 | 2 | to | 0 | 1 | 2½ |
| Sulphide, crystals | ton | 16 | 0 | 0 | to | 16 | 10 | 0 |
| Sulphide, solid, 60-62% | ton | 27 | 10 | 0 | to | 28 | 10 | 0 |
| Sulphite, cryst. | ton | 11 | 10 | 0 | to | 12 | 0 | 0 |
| Strontium, carbonate | ton | 85 | 0 | 0 | to | 90 | 0 | 0 |
| Nitrate | ton | 85 | 0 | 0 | to | 90 | 0 | 0 |
| Sulphate, white | ton | 8 | 10 | 0 | to | 10 | 0 | 0 |
| Sulphur chloride | ton | 40 | 0 | 0 | to | 42 | 10 | 0 |
| Flowers | ton | 24 | 0 | 0 | to | 26 | 0 | 0 |
| Roll | ton | 23 | 0 | 0 | to | 25 | 0 | 0 |
| Tartar emetic | lb. | 0 | 3 | 4 | to | 0 | 3 | 6 |
| Tin perchloride, 33% | lb. | 0 | 2 | 6 | to | 0 | 2 | 7 |
| Perchloride, solid | lb. | 0 | 2 | 9 | to | 0 | 3 | 0 |
| Protochloride (tin crystals) | lb. | 0 | 1 | 10 | to | 0 | 1 | 11 |
| Zinc chloride, 102 Tw. | ton | 22 | 0 | 0 | to | 23 | 10 | 0 |
| Chloride, solid, 96-98% | ton | 50 | 0 | 0 | to | 52 | 10 | 0 |
| Oxide, 99% | ton | 77 | 10 | 0 | to | 80 | 0 | 0 |
| Oxide, 94-95% | ton | 60 | 0 | 0 | to | 62 | 10 | 0 |
| Dust, 90% | ton | 70 | 0 | 0 | to | 72 | 10 | 0 |
| Sulphate | ton | 21 | 10 | 0 | to | 23 | 0 | 0 |
| Oxide, Redseal | ton | 75 | 0 | 0 | to | 80 | 0 | 0 |

## Coal Tar Intermediates, &c.

| | per | £ | s. | d. | | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|
| Alphanaphthol, crude | lb. | 0 | 3 | 0 | to | 0 | 3 | 6 |
| Alphanaphthol, refined | lb. | 0 | 3 | 6 | to | 0 | 3 | 9 |
| Alphanaphthylamine | lb. | 0 | 2 | 7 | to | 0 | 2 | 9 |
| Aniline oil, drums free | lb. | 0 | 1 | 5 | to | 0 | 1 | 6 |
| Aniline salts | lb. | 0 | 1 | 10 | to | 0 | 2 | 0 |
| Anthracene, 85-90% | lb. | 0 | 1 | 5 | to | 0 | 1 | 6 |
| Benzaldehyde (free of chlorine) | lb. | 0 | 6 | 6 | to | 0 | 7 | 0 |
| Benzidine, base | lb. | 0 | 7 | 6 | to | 0 | 8 | 0 |
| Benzidine, sulphate | lb. | 0 | 6 | 6 | to | 0 | 7 | 0 |
| Benzoic, acid | lb. | 0 | 5 | 0 | to | 0 | 5 | 3 |
| Benzoate of soda | lb. | 0 | 5 | 0 | to | 0 | 5 | 3 |
| Benzyl chloride, technical | lb. | 0 | 2 | 0 | | | 2 | 3 |
| Betanaphthol benzoate | lb. | 1 | 6 | 0 | to | 1 | 7 | 6 |
| Betanaphthol | lb. | 0 | 3 | 0 | to | 0 | 3 | |
| Betanaphthylamine, technical | lb. | 0 | 6 | 6 | to | 0 | 7 | 0 |
| Croceine Acid, 100% basis | lb. | 0 | 4 | 9 | to | 0 | 5 | 0 |
| Dichlorbenzol | lb. | 0 | 0 | 5 | to | 0 | 0 | 6 |
| Diethylaniline | lb. | 0 | 7 | 0 | to | 0 | 7 | 6 |
| Dinitrobenzol | lb. | 0 | 1 | 3 | to | 0 | 1 | 4 |
| Dinitrochlorbenzol | lb. | 0 | 1 | 2 | to | 0 | 1 | 3 |
| Dinitronaphthaline | lb. | 0 | 1 | 4 | to | 0 | 1 | 6 |
| Dinitrotoluol | lb. | 0 | 1 | 7 | to | 0 | 1 | 8 |
| Dinitrophenol | lb. | 0 | 1 | 3 | to | 0 | 1 | 6 |
| Dimethylaniline | lb. | 0 | 3 | 3 | to | 0 | 3 | 6 |
| Diphenylamine | lb. | 0 | 3 | 3 | to | 0 | 3 | 6 |
| H-Acid | lb. | 0 | 12 | 6 | to | 0 | 13 | 6 |
| Metaphenylenediamine | lb. | 0 | 4 | 9 | to | 0 | 5 | 0 |
| Monochlorbenzol | lb. | 0 | 0 | 9 | to | 0 | 0 | 10 |
| Metanilic Acid | lb. | 0 | 7 | 6 | to | 0 | 8 | 6 |
| Monosulphonic Acid (2·7) | lb. | 0 | 7 | 0 | to | 0 | 8 | 0 |
| Naphthionic acid, crude | lb. | 0 | 3 | 6 | to | 0 | 3 | 9 |
| Naphthionate of Soda | lb. | 0 | 4 | 3 | to | 0 | 4 | 6 |
| Naphthylamin-di-sulphonic-acid | lb. | 0 | 4 | 6 | to | 0 | 5 | 0 |
| Nitronaphthaline | lb. | 0 | 1 | 2 | to | 0 | 1 | 3 |
| Nitrotoluol | lb. | 0 | 1 | 3 | to | 0 | 1 | 6 |
| Orthoamidophenol, base | lb. | 0 | 18 | 0 | to | 1 | 0 | 0 |
| Orthodichlorbenzol | lb. | 0 | 1 | 1 | to | 0 | 1 | 3 |
| Orthotoluidine | lb. | 0 | 2 | 2 | to | 0 | 2 | 3 |
| Orthonitrotoluol | lb. | 0 | 1 | 6 | to | 0 | 1 | 9 |
| Para-amidophenol, base | lb. | 0 | 14 | 0 | to | 0 | 15 | 0 |
| Para-amidophenol, hydrochlor | lb | 0 | 15 | 6 | to | 0 | 16 | 0 |
| Paradichlorbenzol | lb. | 0 | 0 | 4 | to | 0 | 0 | 5 |
| Paranitraniline | lb. | 0 | 4 | 0 | to | 0 | 4 | 6 |
| Paranitrophenol | lb. | 0 | 1 | 10 | to | 0 | 2 | 0 |
| Paranitrotoluol | lb. | 0 | 5 | 3 | to | 0 | 5 | 6 |
| Paraphenylenediamine, distilled | lb. | 0 | 12 | 0 | to | 0 | 13 | 0 |
| Paratoluidine | lb. | 0 | 7 | 0 | to | 0 | 7 | 6 |
| Phthalic anhydride | lb. | 0 | 9 | 6 | to | 0 | 10 | 6 |
| R. Salt, 100% basis | lb. | 0 | 4 | 0 | to | 0 | 4 | 2 |
| Resorcin, technical | lb. | 0 | 11 | 0 | to | 0 | 12 | 0 |
| Resorcin, pure | lb. | 0 | 17 | 6 | to | 1 | 0 | 0 |
| Salicylic acid | lb. | 0 | 2 | 9 | to | 0 | 3 | 9 |
| Salol | lb. | 0 | 4 | 9 | to | 0 | 5 | 6 |
| Shaeffer acid, 100% basis | lb. | 0 | 3 | 6 | to | 0 | 3 | 0 |
| Sulphanilic acid, crude | lb. | 0 | 1 | 5 | to | 0 | 1 | 6 |
| Tolidine, base | lb. | 0 | 10 | 0 | to | 0 | 10 | 6 |
| Tolidine, mixture | lb. | 0 | 2 | 9 | to | 0 | 3 | 0 |

## Miscellaneous and Paint Materials

| | | £ | s. | d. | | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|
| Barytes | ton | 11 | 0 | 0 | to | 13 | 0 | 0 |
| Casein | ton | 75 | 0 | 0 | to | 80 | 0 | 0 |
| Chalk, precipitated (light) | ton | 20 | 0 | 0 | to | 24 | 0 | 0 |
| Chalk, precipitated (heavy) | ton | 10 | 0 | 0 | to | 12 | 0 | 0 |
| China clay (bags extra) (f.o.r. Cornwall) | ton | 1 | 12 | 6 | to | 3 | 12 | 6 |
| Coke, blast furnace (S. Wales) | ton | 2 | 12 | 6 | to | 3 | 0 | 0 |
| Coke, foundry | ton | 3 | 5 | 0 | to | 3 | 10 | 0 |
| Fuller's Earth | ton | 4 | 0 | 0 | to | 5 | 0 | 0 |
| Lead, litharge flake | ton | 52 | 10 | 0 | to | 53 | 10 | 0 |
| Lead, red | cwt. | 2 | 10 | 0 | to | 2 | 12 | 6 |
| Lead, white | cwt. | 3 | 0 | 0 | to | 3 | 2 | 6 |
| Ultramarine | ton | 90 | 0 | 0 | to | 110 | 0 | 0 |
| Prussian Blue | cwt. | 11 | 0 | 0 | to | 11 | 10 | 0 |
| Chrome green | cwt. | 6 | 5 | 0 | to | 6 | 10 | 0 |
| Chrome yellow | cwt. | 6 | 5 | 0 | to | 7 | 0 | 0 |
| Mineral black | ton | 10 | 0 | 0 | to | 12 | 0 | 0 |
| Carbon black | lb. | 0 | 1 | 3 | to | 0 | 1 | 6 |
| Guignet's Green, 30% | lb. | 0 | 1 | 5 | to | 0 | 1 | 6 |

[We regret that owing to pressure on our space, the prices of building materials, metals and ferro-alloys, and structural steel are unavoidably held over until next week.]

# Company News

ASBESTOS CORPORATION.—Dividend of 1¾ per cent. on the Common stock for quarter ending December 31, plus a bonus of 2 per cent., payable to shareholders registered on January 2.

AMERICAN CYANAMID CO.—Dividend of 3 per cent. (3 dols. per share) on the Preferred stock for the six months ending December 31.

BIRMINGHAM ALUMINIUM CASTING CO.—At an extraordinary general meeting held last week, Mr. W. H. Maudsley (chairman and managing director) presiding, a resolution was passed sanctioning the issue of 100,000 new Ordinary shares to the Harper, Bean Company, in consideration of a payment by the latter of £300,000 in cash. A dividend and bonus equalling 1 per cent. was confirmed at the annual general meeting.

BOWRING PETROLEUM.—On and after January 1 the kerosene and motor spirit business of the Bowring Petroleum Co. will be merged into that of the Anglo-Mexican Petroleum Co., and all payments due to or from the Bowring Petroleum Co. will be payable to or by the Anglo-Mexican Petroleum Co. on and after the same date. This arrangement applies to kerosene and motor spirit only. The two companies have been in close association for some years past and this step, it is stated, is taken to simplify organisation.

BRITISH COTTON & WOOL DYERS.—At an extraordinary general meeting of the British Cotton & Wool Dyers' Association, held at Manchester, Mr. Adolph Hoegger (chairman of the company) presiding, the requisite alteration of the articles of association was duly confirmed, providing for the capitalisation of reserves, and distribution of additional shares in accordance with the scheme outlined at the meeting of December 3, under which the association's nominal share capital was raised from £500,000 in 5s. scrips to £1,000,000 of the same denomination. It was now resolved that £193,541, part of the association's undivided profits at credit of reserve fund, be capitalised, and then a bonus be distributed in the shape of approximately one new Ordinary to every two Ordinary scrips now held, the balance of the new capital powers remaining unissued for future requirements or developments.

CURUM RIVER (NIGERIA) TIN MINES.—Interim dividend of 7½ per cent. (9d. per share), less tax, payable December 24. Last year, dividend same.

EGYPTIAN SALT & SODA.—Profit for the year, including £E141,847 brought in, £E342,363. Dividend of 45 per cent. on the share capital (9s. per share), against 60 per cent. for the previous year; balance forward, £E123,957.

LAUTARO NITRATE.—The directors have decided not to pay an interim dividend. A year ago 5 per cent., free of tax, was distributed.

LOBITOS OILFIELDS.—The directors have declared an interim dividend of 5 per cent., less tax, on account of the profits of the current year, payable January 31.

LOCHGELLY IRON & COAL CO.—Interim dividend of 2s. 6d. per share on the Ordinary shares.

MANGANESE BRONZE & BRASS.—The directors announce that having regard to the existence of various claims upon the Government which still remain unsettled, they have decided not to make any payment on account of dividend before the result of the trading for the year 1919 is ascertained. Last year, 2½ per cent.

MEXICAN EAGLE OIL CO.—First dividend of 35 per cent. on the Preference and Ordinary shares, making 45 per cent. for the year ended June 30, 1919, and a first interim dividend of 5 per cent. on both classes of shares for the year ending June 30, 1920.

MOND NICKEL CO.—Interim dividend of 1s. per share, free of income tax, on the Ordinary shares.

NEW TRANSVAAL CHEMICAL.—Final dividends for the year to June 30 last of 3 per cent., less tax, on the Cumulative First Preference shares, and of 4 per cent., less tax, on the Cumulative "A" Preference shares have been declared.

SAPON SOAPS, LTD.—At the second ordinary general meeting, held in London, dividends were declared of 7 per cent. per annum on the Preference shares for the half-year ended September 30, 1919, and of 2½ per cent. per annum on the ordinary shares for the year ended September 30, 1919. At an extraordinary general meeting held subsequently a resolution was passed to increase the capital of the company to £300,000, by the creation of 500,000 new Ordinary shares of 4s. each, ranking *pari passu* in all respects with the existing Ordinary shares.

VAUXHALL GLASS.—The issue recently made by the Vauxhall Glass Manufacturing Co. has been over-subscribed, and letters of allotment and regret have now been posted.

VIRGINIA (CAROLINA) CHEMICAL.—Usual quarterly dividend of 2 per cent. ($2 per share) on the Preferred stock, payable January 15, and a dividend of $1 per share (1 per cent.) on the Common stock, payable February 2.

ZINC CORPORATION.—The directors have declared a dividend of 2s. per share on the Preference shares, being the second half of the fixed Preferential dividend of 20 per cent. for the year 1919, payable February 2 next, less tax at 3s. 6d. in the £.

# Commercial Intelligence

*The following are taken from printed reports, but we cannot be responsible for any errors that may occur.*

## London Gazette

### Partnership Dissolved

BOWNESS, ALICE SCOWCROFT, BOWNESS, HAROLD AUGUSTUS, BOWNESS, GEORGE PRIESTLEY, drysalters, oil refiners, paint, colour and varnish merchants, Tilverwell Works, Deansgate, Bolton, Lancs, under the style of William Priestley & Co., as and from December 1, 1919, by effluxion of time.

### Application for Debtor's Discharge

HANLEY, JAMES ALEC, lately residing at Vesper Mount, Kirkstall, Leeds, but now of 5, Woodsley Terrace, Leeds, agricultural chemist. January 12, 1920, 10.30 a.m., County Court House, Albion Place, Leeds.

### Notice of Intended Dividend

BRITISH COKE OVENS, LTD., 7, Princes Street, Westminster. January 7, 1920. Harold de Vaux Brougham, Senior Official Receiver and Liquidator, 33, Carey Street, Lincoln's Inn, W.C.

### Joint Stock Companies

THE names of the undermentioned Companies have been struck off the Register of Joint Stock Companies:—

Allagit Silicate, Ltd.
Australasian Improved Chilling Syndicate, Ltd.
Barbados Oil Co., Ltd.
Carbonated Waters, Ltd.
Carbo-Welding Syndicate, Ltd.
Coal Carbonising Patent Syndicate, Ltd.
Hills (Gas Carburetters), Ltd.
Kintyre Coal & Oil Co., Ltd.
Liverpool Universal Explosives, Ltd.
Medway Oil Mills Corporation, Ltd.
National Spanish Silver Lead Mines & Mining Co., Ltd.
Oil Fuel Gas Generator, Ltd.
Pen-y-Pass Copper Co., Ltd.
Russo-Roumanian Oil Co. (Société Russe-Roumano de Pétrole), Ltd.
Trinidad Asphalt & Oil Syndicate, Ltd.
United Kingdom Oilseed Products Association, Ltd.
West African Palm Oil Estates, Ltd.

### Company Winding Up Voluntarily

VENEZUELAN OILFIELDS EXPLORATION CO. LTD.,—Meeting of creditors at 48, Cannon Street, London, E.C.4, on Monday, January 5, at 11 a.m. J. W. Creasser, Liquidator.

## Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of* 1908, *provides that every Mortgage or Charge, as described therein, created after July* 1, 1908, *shall be registered within* 21 *days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July* 1, 1908, *require registration, The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an* *—*followed by the date of the Summary, but such total may have been reduced since such date.*]

ABERTHAW & RHOOSE PORTLAND CEMENT & LIME CO., LTD., CARDIFF.—Registered December 10, £100,000 first mortgage debentures secured by Trust Deed dated November 25, 1919 (filed under sec. 93 (3) of the Companies (Consolidation) Act 1908), present issue £44,100; general charge, including certain leasehold properties. *£69,100. November 11, 1919.

MICA MANUFACTURING CO., LTD., LONDON, N.—Registered December 11, debenture securing all moneys due or to become due, to Barclays Bank, Ltd.; general charge and fixed charge on freehold premises, 218, Holmesdale Road, Bromley, and laundry and other buildings and fixed machinery thereon.

OLEINE LTD., OUZLEWELL GREEN, NR. WAKEFIELD.—Registered December 15, mortgage or charge by way of a resolution of October 28, 1919, executed by the company on December 10, 1919, securing £1,000 debenture stock; general charge. *£8,200. July 29, 1919.

TRIUMPH SOAP CO., LTD., STRATFORD, E.—Registered December 16, £2,300 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act, 1908), present issue £1,810; general charge. *£200. January 3, 1919.

WELSH SILICA CO., LTD., CONNAHS QUAY.—Registered December 11, £2,000 debentures part of £4,500; general charge. *£750. May 15, 1918.

YORKSHIRE GREASE & FERTILISER CO., LTD., OUZLEWOOD GREEN, NR. WAKEFIELD.—Registered December 15, mortgage or charge by way of resolution of March 28, 1919, executed by the company on December 10, 1919, securing £1,000 debenture stock; general charge. *£3,650. July 29, 1919.

**Satisfactions**

ABERTHAW & RHOOSE PORTLAND CEMENT & LIME CO., LTD., CARDIFF.—Satisfactions registered December 10, £25,000, registered November 9, 1912; £30,000 registered January 15, 1913; and £14,100, balance of series of £25,000, registered December 6, 1913. (N.B.—The remainder of the series not having been issued are cancelled.)

NOTTINGHAM CHEMICAL CO., LTD.—Satisfaction registered December 13, £200, registered May 4, 1917.

SURREY FULLERS' EARTH CO., LTD., HUDDERSFIELD.—Satisfaction registered December 17, £2,000, balance of amount outstanding July 1, 1908.

## County Court Judgments

*[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]*

MAY, A., 55, Radner Street, E.C., colour dyer. £18 12s. 2d. November 12, 1919.

HUTCHEON, JOHN, 139, Golden Hillock Road, Small Heath, Birmingham, Chemist; and HUTCHEON, MARGARET (his wife), trading as Hutcheon's Pharmacy. £10 5s. 9d. November 20, 1919.

## New Companies Registered

The following list has been prepared for us by Jordan & Sons' Ltd., Company Registration Agents, 116 and 117, Chancery Lane' London. W.C.:—

ANGLO-AMERICAN NITROGEN CO., LTD., Public Wharf, Belgrave Gate, Leicester.—Chemical fertiliser manufacturers. Nominal Capital, £25,000 in 25,000 shares of £1 each. Directors: D. Main, Springfield Road, Leicester; J. H. Main, Springfield Road, Leicester; W. P. Main, Springfield Road, Leicester. Qualification of Directors, 250 Ordinary shares.

ANGLO-FRENCH MIDDLE EAST DEVELOPMENT CORPORATION, LTD.—To acquire land for the purpose of boring, searching for, getting and making merchantable mineral oils and other mineral substances. Nominal Capital, £42,000 in 400 "A" shares of £100 each, and 200 "B" shares of £10 each. Directors: Earl of Drogheda, 40, Wilton Crescent, S.W.1; Right Hon. Lord Inchcape, 122, Leadenhall Street, E.C.; Sir T. Royden, Bart., 34, Dover Street, W.1; Comte F. M. E. Pillet-Will, 31, Faubourg, St. Honore, Paris; J. Exbrayat, 27, rue de Londres, Paris; M. Devies, 15, rue Spontini, Paris. Qualification of Directors, £500. Remuneration of Directors, £100 each; Chairman, £200.

ANGLO SOUTH AMERICAN OILFIELDS, LTD., 24, College Street, E.C.4.—To acquire oil or other mines and turn same to account. Nominal Capital, £250,000 in 500,000 shares of 10s. each. Minimum subscription, £7. Directors: To be appointed by subscribers. Qualification of Directors, £200. Remuneration of Directors, £300 each.

ATLANTIC OIL SYNDICATE, LTD., Friars House, New Broad St., E.C.2.—To acquire oil-bearing lands and winning of mineral oil of any kind. Nominal Capital, £50,000 in 200,000 shares of 5s. each. Minimum subscription, 7 shares. Directors to be appointed by subscribers. Qualification of Directors, other than First Directors, 500 shares. Remuneration of Directors, £150 each; Chairman, £200.

CALLOOSE TIN MINES & ALLUVIALS, LTD., Boston House, 63/64, New Broad Street, E.C.—To acquire tin mining properties in Cornwall and turn same to account. Nominal Capital, £125,000 in 500,000 Ordinary shares of 5s. each. Minimum subscription, 10 Ordinary shares. Directors: G. Hill, 35A, Winchester Road, N.W.; F. D. Holcombe, 6, Great James' Street, W.C.1; G. W. Haydon, 36, Muirkirk Road, Catford, S.E., and four others. Qualification of Directors, 400 Ordinary shares. Remuneration of Directors, £100 each; Chairman, £150.

CASCOLL ENGINEERING CO., LTD., 20, Garden Street, Marsh Lane, Leeds.—Mechanical, chemical and electrical engineers. Nominal Capital, £1,000 in 1,000 shares of £1 each. Directors: C. F. Casperson; R. Collins. Qualification of Directors, 1 share. Remuneration of Directors, £000 to be divided.

CHEMICAL PRODUCTS, LTD., 16A, Grainger Street, Newcastle-on-Tyne.—Manufacturers of soap, starch, blue, washing and bleaching powders. Nominal Capital, £6,000 in 4,000 Ordinary shares of £1 each, and 2,000 Preference shares of £1 each. Directors: H. A. Haley; H. E. Hudson; E. Redhead; R. Shorrock. Qualification of Directors, £100.

COVENTRY FAT & BONE CO., LTD., 43, Cannon Street, Birmingham.—Bone boilers, fat, grease, oil, tallow and soap manufacturers. Nominal Capital, £10,000 in 10,000 shares of £1 each. Directors: C. E. Bacon, Aubrey Road, Small Heath, Birmingham. Qualification of Directors, £1.

DRIED MILK DAIRY PRODUCTS, LTD.—Manufacturers of dried milk, milk powder, condensed, concentrated or evaporated milk. Nominal Capital, £20,000 in 20,000 shares of £1 each. Directors to be appointed by subscribers. Remuneration of Directors, £50, to be divided. Subscribers: C. S. Giddins, 6, Martin Lane, E.C.4; W. J. A. Drake, 79, Kingston Road, Wimbledon, S.W.9.

EVERSHED, J., & SON, LTD., 81, Eastern Road, Brighton.—Soap and candle manufacturers and drysalters. Nominal Capital, £60,000 in 60,000 shares of £1 each. Directors: F. J. Evershed, 20, New Steine, Brighton, Governing Director; H. G. Evershed, Friars Court, Shoreham-by-the-Sea. Qualification of Directors, £100. 5,000 shares Governing Directors.

GREAVES, A. & SON, LTD.—Chemists and druggists. Nominal Capital, £8,000 in 4,000 Preference shares of £1 each, and 4,000 Ordinary shares of £1 each. Directors: A. W. Greaves, Rye Hill House, Chesterfield; S. C. Greaves, 198, Ashgate Road, Chesterfield; Eliza M. Greaves, Rye Hill House, Chesterfield. Qualification of Directors, £100.

HARDMAN, JOHN, & CO., LTD.—Manufacturers of coloured glass and stained glass windows. Nominal Capital, £12,000 in 12,000 shares of £1 each. Directors: J. T. Hardman, New Hall, Hill, Birmingham; D. J. Powell, New Hall, Hill, Birmingham. Qualification of Directors, 500 Ordinary shares.

HUME PIPE & CONCRETE CONSTRUCTION CO., LTD., 80, Finsbury Pavement, E.C.2.—Manufacturers of re-inforced and other concrete tubes or pipes. Nominal Capital, £610,000 in 600,000 Ordinary shares of £1, and 200,000 Deferred shares of 1s. each. Minimum subscription, 7 shares. Directors: E. Newton, 3A, Marysville Terrace, Colney Hatch Lane, N.17; H. W. Hill, 74, Grantham Road, Stockwell, S.W.9; G. W. Watson, 39, Jerningham Road, S.W.14. Qualification of Directors, £500. Remuneration of Directors, £400 each; Chairman, £650.


## For Sale or Wanted

*(Three lines, 3s.; each additional line, 1s.)*

WANTED.—LEAD, remelted in pigs or ingots. Also Lead Ashes, Slags, and Skimmings. Prompt cash terms.—SPOONER, SON & CO., 214, Bishopsgate, London, E.C.2. Telephone: London Wall 5959. Telegrams: "Spooneral, London."

SPECTROSCOPES, MICROSCOPES, bought, sold, and exchanged. List free.—JOHN BROWNING, 146, Strand, W.C.

3 OIL TANKS, 8′ 6″ dia. × 30′ 0″ long, capacity about 10,400 gallons, tight for storage. Only £150 each.

6 DISHED AIR RECEIVERS or PRESSURE TANKS, 6′ 0″ dia. × 24′ 0″ long, tested to 60/80 lbs. pressure.

3 BOAT SHAPED TANKS, from Lancashire Boilers, 8′ 6″ dia. × 30′ 0″.

Large stock various Tanks, Receivers, Chimneys, etc. Priced List, drawings sent on application.—FIRTH BLAKELEY, SONS & CO., LTD., Church Fenton, via Leeds.

WATER POWER, 1,000 to 2,000 H.P., in Ireland, on navigable river near limestone beds. Owners would lease direct, or harnessing would be carried out for good proposition.—Reply, Box 45, CHEMICAL AGE Offices, 8, Bouverie Street, E.C. 4.

## Situations Vacant.

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Unless specially asked for, Original Testimonials should NOT be forwarded with Applications, but only copies of them.

LABORATORY CHEMIST Wanted for General Analytical work and testing of Raw Materials, etc., in a Yorkshire Chemical Works. One with some knowledge of Intermediate Coal Tar Products preferred.—Reply, stating age, previous experience and salary required, to Box 43, CHEMICAL AGE Offices, 8, Bouverie Street, E.C.4.

WANTED.—MANAGER to take charge of Works for making Crystal Carbolic, Ortho and Para Cresols. Please state experience and salary required to Box No. 42, CHEMICAL AGE Offices, 8, Bouverie Street, E.C. 4.

ENERGETIC SALESMAN (outside) required by Established Firm of Chemical Manufacturers and Merchants. Must be thoroughly conversant with the Chemical Trade and have a good standing among buyers and sellers in the trade. Salary and share of profits. Write giving full particulars as to past experience. An exceptional opportunity for the right man.—Box No. 44, CHEMICAL AGE Offices, 8, Bouverie Street, E.C., 4.

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